Transitway Guidelines Technical Report

Regional Transitway Guidelines

May 2011

1. INTRODUCTION

1.1. PURPOSE OF GUIDELINES

The purpose of the Regional Transitway Guidelines is to provide technical guidance, based in best practices, that supports the development and operation of transitways in a way that is **consistent**, **equitable**, and **efficient**, and delivers an **effective**, **integrated**, and **user-friendly** transit system throughout the Twin Cities region. Existing practices have been documented; best practices have been researched; and recommendations on guidelines for future transitway planning and implementation have been developed on many issues. The guidelines will continue to evolve over time as the region's experience with transitway implementation grows and as new technologies and best practices emerge.

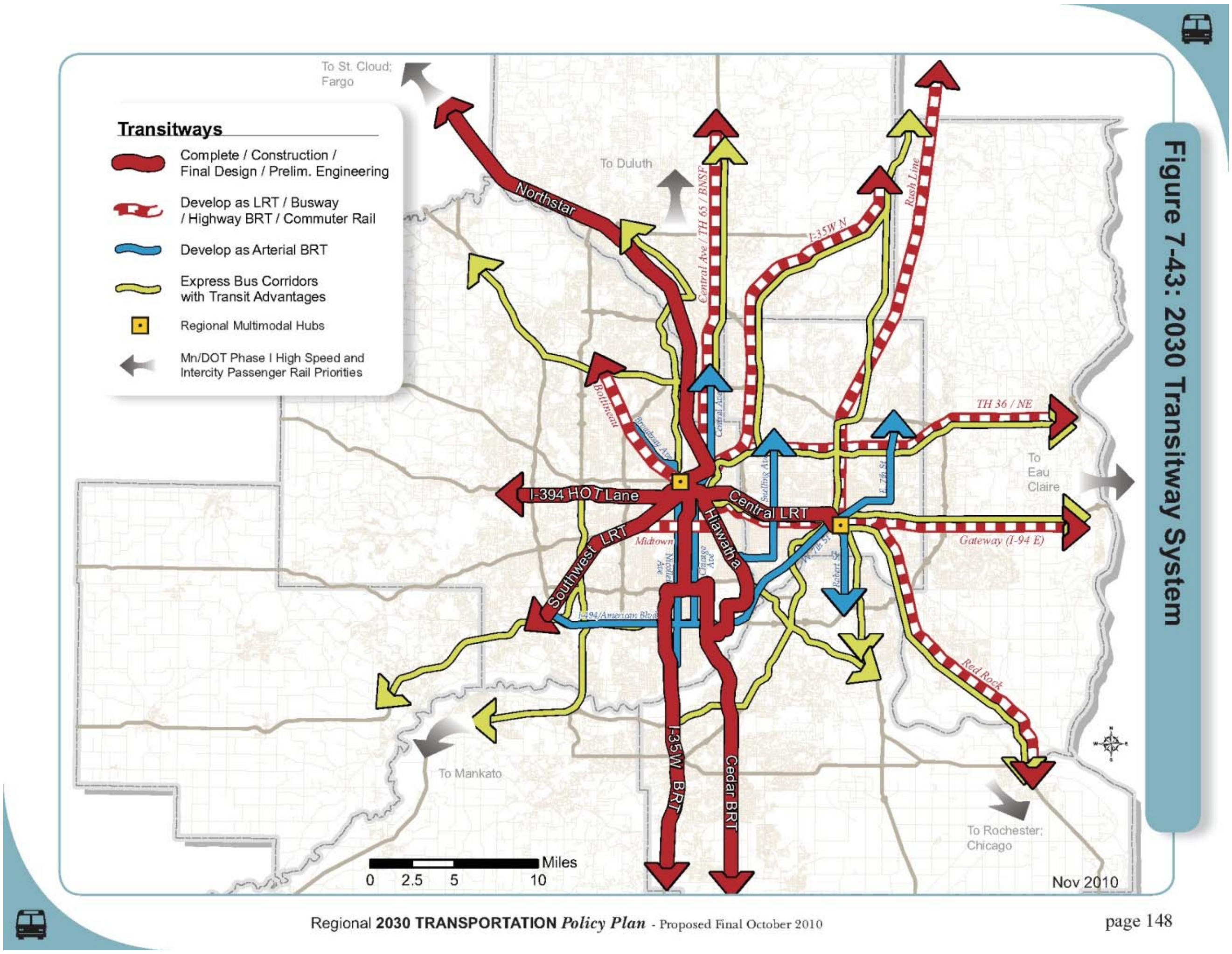
Regional transitway guidelines are needed for three primary reasons:

- **The region's progressively growing transitway system.** The region's transitway system is growing quickly and the region has learned a great deal from the implementation of the first commuter rail and light rail lines. Those lessons will help to guide the implementation of future transitways. This is important for leveraging future investments, for proceeding efficiently through planning and design (not reinventing the wheel each time), and for achieving the regional goal of doubling transit ridership by 2030.
- **Multiple agencies involved in transitway implementation.** There are multiple agencies involved in the planning and implementation of transitways in the Twin Cities region. Local governments, particularly counties and regional railroad authorities, play a lead role in the planning of transitway corridors and recommending locally preferred alternatives. The Minnesota Department of Transportation (Mn/DOT), Metropolitan Council and Metro Transit, Counties Transit Improvement Board (CTIB), counties, and cities are involved in the funding, design, and construction of transitway facilities and services. There are also agencies that are involved in the operation of transitway service. As the region moves toward implementation of multiple transitway corridors, it is important that the assumptions used to plan transitways and the decisions made to implement them are consistent and equitable throughout the region.
- **The region is taking initial steps to implement BRT.** The region is implementing its first bus-rapid transit (BRT) corridors in which a family of services will operate. These corridors also have the flexibility to be implemented in phases as ridership develops over time. While this can be beneficial from a funding perspective, it can lead to confusion about what constitutes BRT service and BRT facilities and the appropriate timing of implementation in phases.

1.2. TRANSITWAY MODES ADDRESSED IN THE GUIDELINES

The Regional Transitway Guidelines address and apply to regionally identified transitways as included in the region's long-range Transportation Policy Plan (TPP) (see Figure 1-1). These facilities enable reliable travel times and a predictable passenger experience on high-demand corridors in the region, whether by rail or by bus. Transitways give transit passengers a travel time advantage over congested roadways by providing a dedicated right-of-way or other transit advantages such as ramp meter bypasses, signal priority, and/or bus-only shoulders. Transitways link major employment centers and destinations in the region and promote transit-oriented development patterns. The Guidelines address four transitway modes: (1) Commuter Rail, (2) Light-Rail Transit (LRT), (3) Highway Bus-Rapid Transit, and (4) Arterial Bus-Rapid Transit. The Guidelines currently do *not* directly address the Express Bus with Transit Advantages, Dedicated Busway, or Streetcar modes. However, transitway projects in planning stages where these modes are being considered can use the general information in the Guidelines as a base for decision-making. It is anticipated that the Guidelines will be updated in the future to include these modes.

Figure 1-1 – 2030 Transitway System Plan



1.2.1. Commuter Rail

Commuter Rail operates on existing freight railroad tracks. Commuter Rail vehicles may use diesel multiple unit (DMU) vehicles or conventional diesel locomotives pulling passenger coaches. Commuter Rail may operate on freight railroad tracks that also carry intercity passenger rail traffic operated by Amtrak, potentially using common stations. Lines are typically 20 or more miles long, with stations typically spaced five or more miles apart. Station areas are primarily oriented to park-and-ride uses. Commuter Rail services operate at 20- to 30-minute frequencies during peak periods, with limited or no midday or reverse-direction service.

1.2.2. Light-Rail Transit

LRT operates on rails primarily in exclusive rights-of-way. Vehicles are powered by overhead electrical wires. Stations are typically spaced about one-half to one mile or more apart. Typical LRT lines are 10 to 15 miles long. LRT trains operate all day, with bidirectional service at frequencies of 10 minutes or better during peak periods. Typical characteristics of LRT include dedicated right-of-way, specialized stations and vehicles, off-board fare collection, and traffic signal priority.

1.2.3. Highway Bus-Rapid Transit

Highway BRT is a transitway mode that uses bus vehicles while incorporating many of the characteristics of Light Rail or Commuter Rail. Highway BRT operates on freeways or expressways. It can use bus-only shoulders, managed lanes, ramp meter bypasses, priced dynamic lanes, and other running-way advantages. In addition to peak express service, Highway BRT also incorporates high frequency, all-day service, branded vehicles, and improved stations, including park-and-ride facilities and online stations. Bus-rapid transit improvements can also be used by other types of bus service like regular express buses, limited stop service, or routes that are partly local service and partly express.

1.2.4. Arterial Bus Rapid Transit

Arterial BRT provides limited stop service in high-ridership corridors along existing roadways. The *2030 Transit Master Study* showed that substantial ridership growth could be achieved through faster and higher frequency service on high-ridership arterial corridors. These corridors are all in highly developed areas with very limited right-of-way availability, meaning that LRT or dedicated busways are most likely not feasible. Arterial BRT could provide limited-stop service and use technology improvements to provide a faster trip in these corridors and use branding to differentiate the service from regular bus routes. The *Arterial Transitway Corridors Study* (ATCS) began in late 2010 and is scheduled to conclude in late 2011. The study will develop a facility and service plan to enhance efficiency, speed, reliability, customer amenities, and transit market competitiveness on the nine corridors identified the TPP, on Hennepin Avenue, and in the Lake Street/Midtown Greenway corridor.

1.3. TRANSITWAY CHARACTERISTICS

Four operating characteristics differentiate transitways from regular transit service:

- Speed - how fast a transit vehicle operates

- Travel time reliability - how predictable and consistent each trip is for passengers and transit vehicles
- Accessibility - the number and spacing of stops, how convenient stops are for passengers, and how coordinated stops are with connecting travel modes
- Service availability - how frequent vehicles service each stop and how early and late in the day vehicles run

Using these characteristics, the transitway modes included in the guidelines were categorized to better communicate the relationship between regular transit service and transitway services and the relationship between transitway services (see Table 1-1). Similar tables were developed by several technical committees and can be found in the technical memoranda.

1.4. GUIDELINES DEVELOPMENT PROCESS

More than 100 people and 25 organizations participated in 10 technical committees charged with drafting initial guidelines for consideration by an Advisory Committee. (see Figure 1-2 and **Table 1-3 – Regional Transitway Guidelines Technical Committees**Table 1-2). The Advisory Committee recommended the guidelines to be adopted by the Metropolitan Council.

Table 1-1 – Transit Service Descriptions

	Local Bus	All-day Frequent Service Frequent, bidirectional, all-day service that is faster than local bus			Commuter Express Service Primarily peak-period, peak-direction, fast commuter service to concentrated employment areas		
	Local Bus (Benchmark)	Arterial BRT	Highway BRT Station-to-Station	Light Rail	Express Bus (Benchmark)	Highway BRT Express	Commuter Rail
Description	Frequent stops on fixed routes that maximizes access and mobility to a variety of markets	All-day, frequent, limited stop bus service operated on more local, arterial streets with enhanced passenger amenities and some time travel advantages over regular local bus service	All-day frequent bus service on highway corridors with transit advantages greater than a shoulder with typically online or nearly on-line stations, and enhanced passenger amenities	All-day frequent rail service on exclusive tracks with stations, high-capacity vehicles, and enhanced passenger amenities	Longer routes supported by transit advantages and designed for commuter travel to provide additional capacity on highway corridors and an alternative to driving alone	Express bus service operating in highway BRT corridor with runningway greater than a shoulder and typically online or nearly on-line stations. Express service coordinated with Highway BRT station-to-station service.	Fast commuter service operating on traditional rail lines with farther station spacing and trips primarily during the peak-period
Speed	Low	Medium	Medium-High	Medium-High	High	High	High
Travel Time Reliability	Medium	Medium-High	High	High	Medium	Medium-High	High
Accessibility (Station Spacing)	High	Medium-High	Medium	Medium	Low	Low[1]	Low
Service Availability	High	High	High	High	Low	Low[1]	Low
Market Area Served (TPP)[2]	1,2,3	1,2,3	1,2,3	1,2,3	MPLS-St. Paul CBDs, UofM,2,3,4	MPLS-St. Paul CBDs, UofM,2,3,4	MPLS-St. Paul CBDs,3,4,5
Daily Boardings	200 – 18,000	Est. 5,000 to 15,000[3]	2,000 - 8,000	20,000 - 40,000	150 – 2,300	3,000 - 5,400[4]	2,000

Notes:
(1) While Highway BRT Express service has low accessibility and availability on its own, the overall accessibility and availability of Highway BRT is medium and high respectively because of complementary station-to-station service.
(2) Based on discussion in the 2030 Transportation Policy Plan (Nov. 2010), Appendix G: Regional Transit Standards.
(3) Local bus routes in these corridors carried 3,000 - 10,000 rides per day in 2008.
(4) Cedar Avenue work has forecast 5,400 rides per weekday for 2030.

Figure 1-2 – Transitway Guidelines Committee Structure and Chairs

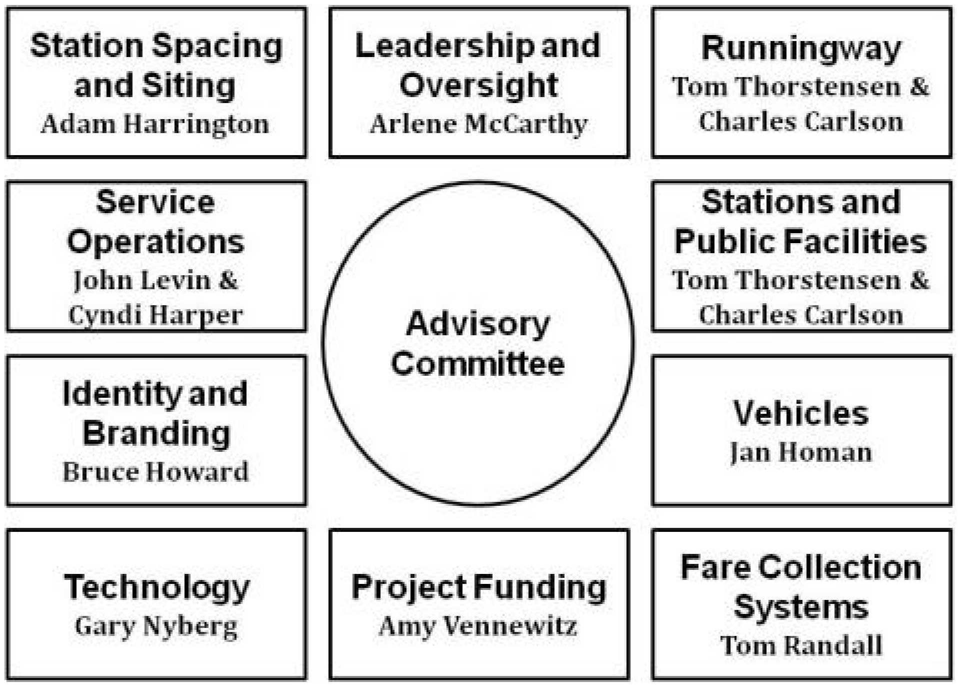


Table 1-2 – Regional Transitway Guidelines Advisory Committee

Metropolitan Council	Wendy Wulff, chair Kirstin Sersland Beach (2010) Lona Schreiber (2011)
Metropolitan Council MTS Director	Arlene McCarthy
Counties Transit Improvement Board (CTIB)	Commissioner Peter McLaughlin - Hennepin County Commissioner Jim McDonough - Ramsey County Commissioner Dan Erhart - Anoka County (2010) Commissioner Nancy Schouweiler - Dakota County (2011)
Suburban Transit Association (STA)	Commissioner Will Branning – MVTA Chair
Mn/DOT	Tim Henkel, Asst. Commissioner Planning and Programming
Transportation Advisory Board (TAB)	Russ Stark, St. Paul City Council

Ten technical committees began meeting in the spring of 2010 and technical work on the guidelines continued through the end of 2010. The technical committees are shown in Table 1-3. Members of the technical committees were drawn from the following organizations:

- Transportation Advisory Board (TAB) and its Technical Advisory Committee (TAC)

- Minnesota Department of Transportation (Mn/DOT)
- Minnesota Management & Budget (MMB)
- Commission of Deaf, Deaf-Blind, and Hard of Hearing Minnesotans
- University of Minnesota
- Counties Transit Improvement Board (CTIB)
- Suburban Transit Association (STA) (serving areas with transitways identified for investment in the TPP, including Minnesota Valley Transit Authority, SouthWest Transit, and Maple Grove)
- Cities served by transitways identified for investment in the TPP (Blaine, Bloomington, Brooklyn Park, Columbus, Lakeville, Minneapolis, St. Louis Park, St. Paul and Woodbury)
- Metropolitan Council

A full list of the technical committee participants can be found in Appendix A.

1.5. DELIVERABLES

The Regional Transitway Guidelines development effort produced two deliverables:

- A stand-alone report documenting the Regional Transitway Guidelines adopted by the Metropolitan Council.
- This series of technical memoranda prepared by the technical committees. These technical memoranda provide supporting documentation for the guidelines including existing practices, best practices from the Twin Cities region and other regions, and recommended guidelines. General information about the transitways documented within this region is include in Appendix B including ridership (existing or projected), mode, opening date, corridor length, number of stations, capital cost, and local communities. A general summary of the transitways and transit systems documented in other regions is included in Appendix C including generic information about ridership, mode (including a list of transitways in the system), opening date, regional demographics, and lead agencies.

While the technical memoranda are considered the final deliverables from the technical committees, the recommendations presented here do not necessarily represent agreement by all members of the technical committees. The final recommendations reflect input from the Technical Committees, the Advisory Committee, Metro Transit and Metropolitan Council senior staff, and other technical resources, as noted.

Table 1-3 – Regional Transitway Guidelines Technical Committees

Committee	Guidelines Topics
Service Operations (Chapter 2)	Transitway service definitions; route structure; minimum service frequencies; minimum spans of service; connecting services that need to be coordinated with transitways; maximum transitway travel times when compared to other modes; transitway market area definitions; and the relationship between complementary and competing transit services
Station Spacing and Siting (Chapter 3)	Primary station market analysis factors and methods; transportation site location factors; land use site location factors; minimum daily boardings; average station spacing for a line; minimum spacing between two stations; minimum distance between Minneapolis/St. Paul central business districts (CBDs) and the next station; and adding stations.
Station and Support Facility (Chapter 4)	Guiding principles for station and support facility planning and design; facilities to be included at transitway stations; transitway station enclosure; transitway station design; provision of landscaping, streetscaping, and public art; provision of transitway passenger information; pedestrian and bicycle access; transitway station safety and security; provision of transitway support facilities; and local betterments. The committee's work was supported by a consultant.
Runningway (Chapter 5)	A majority of the effort focused on BRT runningways, but guidelines were developed for LRT, Commuter Rail, Highway BRT, and Arterial BRT runningways, along with bicycle and pedestrian access. The guidelines identify the range of runningway types appropriate for each transitway mode, the number of tracks/lanes in each direction, and the positioning of the runningway relative to other transportation facilities. The bicycle and pedestrian access guidelines discuss runningway crossings including grade-separated crossings. The committee's work was supported by a consultant.
Vehicles (Chapter 6)	The vehicles committee primarily focused their efforts on BRT vehicles that operate frequent, all-day service. Topics included vehicle sizing and capacity considerations; passenger boarding relationship and considerations for making boarding quick and convenient; customer comfort and safety considerations; exterior and interior styling; noise; vehicle integration into the standard fleet and compatibility issues; propulsion technology; and cost considerations
Fare Collection Systems (Chapter 7)	Proven and reliable fare collection system methods and technologies; customer convenience; service requirements; data recording and processing; "fit" within the region.
Technology/Customer Information (Chapter 8)	Automated vehicle location (AVL) technology requirements; automatic passenger counters (APC) requirements; transit signal priority (TSP) coordination, compatibility, and characteristics; real-time customer information requirements; a future technology needs assessment process; technology implementation viability considerations;
Identity and Branding (Chapter 9)	Integration of a branding scheme into transitways; line colors; station, signage, and vehicle branding and identity; station naming; customer information; and advertising
Project Funding (Chapter 10)	No guidelines proposed. Guidelines regarding financial planning and management were incorporated into Project Development, Leadership, and Oversight as responsibilities of the lead organization. The committee also produced a document summarizing key background information for transitway funding.
Project Development, Leadership, and Oversight (Chapter 10)	Project development process; coordination of agencies and stakeholders; lead agency candidates and responsibilities; transit operator selection; transit service planning; transitway travel demand forecasting; capital investment criteria; and deviations from the transitway guidelines.

2. SERVICE OPERATIONS

2.1. INTRODUCTION

2.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway service operations through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the remainder of this chapter is organized into the following sections:

- Relevant background information including applicable laws, regional policies and existing conditions in other regions
- Existing services and planned expansion in this region
- Guidelines recommended through the technical development process.

2.1.2. Committee Purpose

The primary goal of the Service Operations Technical Committee was to establish operational guidelines for transitways, similar to those already in place for local and express transit routes as outlined in Appendix G of the *Transportation Policy Plan* (TPP). These guidelines are meant to frame the region's expectations for service levels during the development phase of a transitway project and provide guidance on the level of service expected during implementation. They will ensure that transitway services will meet the greatest number of travel demands in a corridor in the most cost-effective manner. These guidelines will provide consistent service design across transitways, which will make the services easier for our riders to understand.

2.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the Service Operations discussion include Arterial Bus-Rapid Transit (BRT), Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

2.2. BACKGROUND INFORMATION

2.2.1. Definitions

The following section defines terms applicable to the Service Operations Guidelines.

<u>Arterial routes</u> – Transit routes on major local streets. These routes typically have higher frequencies of bus service.

<u>Branch</u> – Segment of a local route served by some, but not all, trips; one of multiple segments served by a route. Branches are forks in the main trunk of a route, usually appropriate where a significant destination or pocket of population density is located some distance from the main portion of the route. Branches apply primarily to local routes but also can be used in situations where an express route has more than one local tail.

Express transit service – Service where buses operate nonstop on highways for a distance of at least four miles. Includes peak-only and all-day express service. Express routes provide travel times competitive with driving in an automobile. Most express routes operate longer distances (8-25 miles) and during peak times, and are destined to and from one of the two major downtowns.

Local tail – The portion of an express route where the bus operates as a local route segment, designed to serve a walk-up market by making frequent stops and having lower travel speeds. On trips traveling towards downtown, this segment is generally before a park-and-ride is served and the route enters the highway to travel non-stop to its primary destination.

Peak period – The time when traffic and transit ridership is heaviest, usually between 6:30 a.m. and 9:00 a.m. and between 3:00 p.m. and 6:00 p.m. on a weekday.

Service frequency – The average number of minutes between transit vehicles on a given route or line, moving in the same direction.

Service span – The number of hours during the day between the start and end of service on a transit route.

Short line – A short line trip is one that does not travel the full length of the route but instead turns back short of the farthest route terminal, found on routes with uneven demand patterns.

Suburban local transit service – Service where buses operate in suburban environments, beyond first-ring suburbs, as suburban circulators or suburb-to-suburb crosstowns (often as feeder routes to radial services). In some cases, this may include specially designed paratransit services.

Transit advantages – Facility improvements that offer travel-time benefits to multi-occupant and transit vehicles. Examples include bus-only shoulders, bus lanes, high-occupancy vehicle (HOV)/high-occupancy toll (HOT) lanes, priced dynamic shoulders, ramp meter bypasses, signal preemption, transit centers, transit stations, and major park-and-ride lots.

Transit market area – The Twin Cities region has been divided into five areas, depending on their land use and demographic characteristics. These characteristics determine the types of transit service that are appropriate. See Appendix G of the TPP for a full description of the Twin Cities market areas.

Trunk – The segment of a transit route served by all of the trips that offers the highest frequency of service.

Urban local transit service – Service where buses operate primarily in central cities and first-ring suburbs. Includes regular-route radial service (routes serve one or both of the two major downtowns), crosstown service (usually providing connecting links between radial routes), and limited stop service (buses make limited stops as a supplement to local service along a route or “skip stops,” achieving faster service to selected destinations).

The relationship between branch, long line, short line, trunk, and local tail can be complex. The following examples are used to illustrate how the various transit line components may relate to each other.

Short line/long line/trunk example: All trips on a local route travel between downtown Minneapolis and the U of M and most trips continue to downtown St. Paul, primarily using Elm St. The trips between the two downtowns are considered long-line trips. The trips that only travel between downtown Minneapolis and the U of M, which is the segment of the route with the heaviest ridership activity, are the short-line trips. The portion of the route on Elm St. between downtown Minneapolis and the U of M is the trunk.

Branch example: All trips on a local route travel between a suburban transit center and the intersection of Main St./1st St., primarily using Main St. South of Main St./1st St., some trips continue south to Main St./10th St. while the other trips travel west to the light rail station. The section of the route between the transit center and Main St./1st St. is the trunk, and the segments to the rail station and to Main St./10th St. are branches.

Local tail example: All trips on an express route travel non-stop between downtown Minneapolis and the Main St. Park and Ride. A few of these trips continue beyond the park and ride to serve a nearby townhome complex and single-family home subdivision. The portion of the route beyond the park and ride to the apartments and subdivision is the local tail.

2.2.2. Existing Laws and Regulations

The following section summarizes the existing laws and requirements that are relevant to the Service Operations Guidelines.

Light-Rail Transit Construction and Operation (Minnesota Statutes, section 473.4051, subdivision 1) - The Metropolitan Council will operate all LRT facilities and services located in the Twin Cities region.

Commuter Rail Operation and Maintenance (Minnesota Statutes 2008, section 473.4057, subdivision 1) - The Metropolitan Council will operate and maintain Commuter Rail facilities and services located in the Twin Cities region.

Title VI - Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color and national origin for any program that receives federal funding assistance. The TPP addresses environmental justice at a system level by providing a location analysis of low-income and minority populations in relation to planned investments. However, it can be difficult to analyze the impacts of a transportation improvement project on low-income and minority populations at the policy level. Since federal funding typically plays a significant role in transitway planning and development, all aspects of transitway projects must comply with Title VI. The impacts of a specific project on low-income and minority populations will need to be analyzed as part of the project development and planning phase, and the entire system’s compliance will need to be monitored over time. The TPP states that new projects should not create disproportionate adverse effects and, in fact, should create a benefit to low-income and minority populations in the form of improved mobility and expanded transit service.

Federal Transit Administration (FTA) Requirements - Some transitways may be eligible for federal funding. While there are several federal funding mechanisms for transit, there are three primary FTA programs for large capital improvements (such as transitways) including New Starts, Small Starts, and Very Small Starts. In order to be eligible for federal funding, transitway projects must meet FTA performance criteria appropriate for the grant type.

The Small and Very Small Starts Guidance include minimum elements for a bus project to meet funding eligibility, if not on a fixed-guideway for at least 50 percent of the corridor. The service operations element reads as follows:

> *“10-minute peak/15-minute off-peak headways or better while operating at least 14 hours per weekday.”*

This minimum requirement applies to any new fixed-guideway project or corridor-based bus project seeking Small or Very Small Starts funding.

2.2.3. Existing Regional Policy

The following section summarizes the existing regional policy that is relevant to the Service Operations Guidelines.

2.2.3.1. 2030 Transportation Policy Plan

The region's long-range transportation plan, the TPP, includes several sections that address or relate to transitways. Chapter 4: Transportation and Land Use and Chapter 5: Regional Mobility outline regional policies that relate to transit, transitways, and coordination with the broader transportation network. Chapter 7: Transit is the long-range transit plan for the region. It outlines policies and plans for the future transit system, including the development of transitways.

Appendix G: Regional Transit Standards is an important section that presents tools for helping transit planners and policy-makers understand the transit market and market potential. Several planning and operational standards are identified in the appendix and provide a strong basis for developing transitway guidelines. The standards relevant to the Service Operations Guidelines are summarized below.

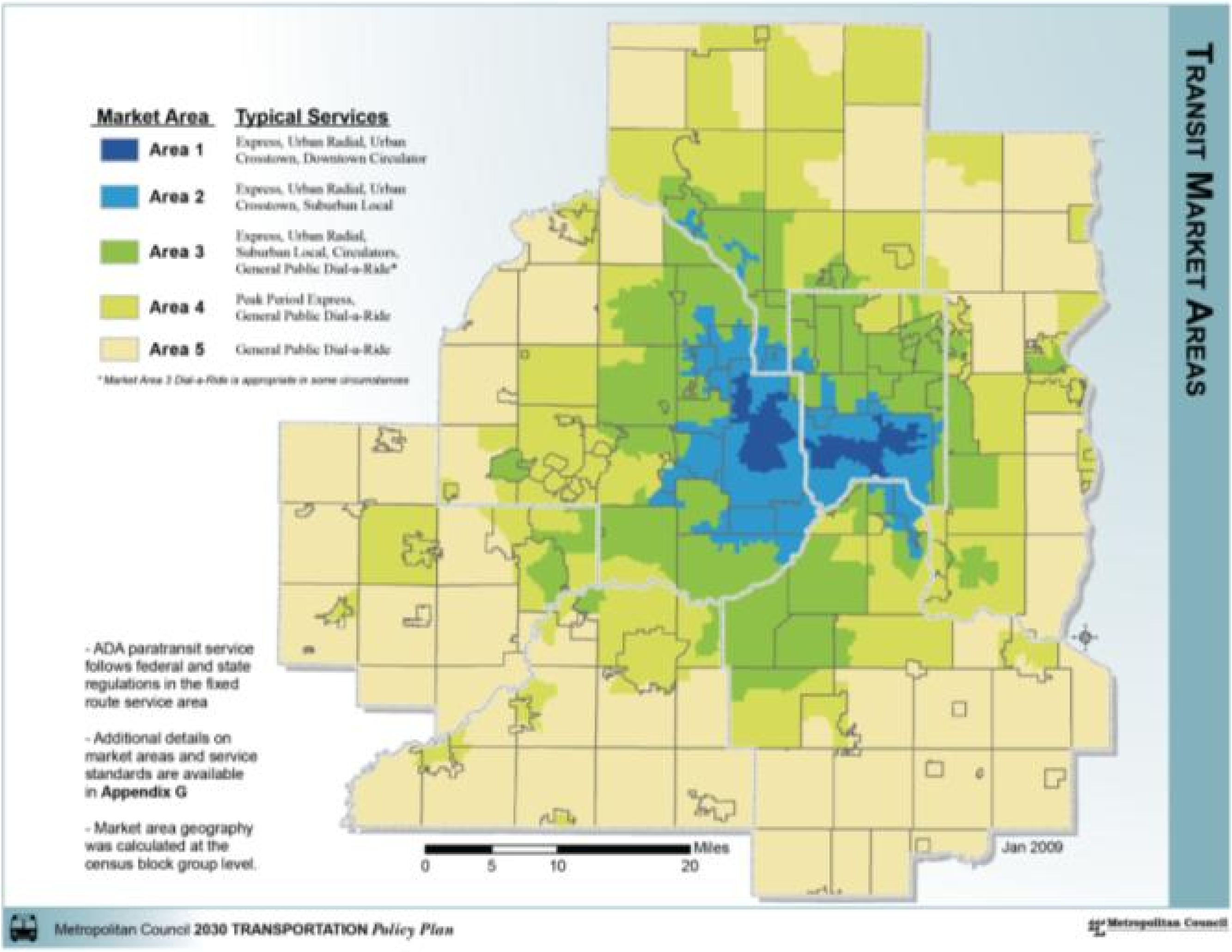
Service Type by Market Area - Figure 2-1 – Transit Service Types by Market Area (TPP: Appendix G, Table G-2) identifies transit service types best suited for different transit market areas. The primary factors in identifying these market areas are population and employment density and auto ownership. The TPP also acknowledges that transitways are unique transportation corridors with specific, detailed planning processes that result in appropriate levels of service for specific corridors. The detailed planning work on transitway corridors leads to unique applications of transit service design standards and specific types of service unique to each corridor. Figure 2-2 – Transit Market Areas illustrates the existing market areas in the 7-county metro area. The current TPP acknowledges the uniqueness of each transitway corridor and how this relates to the need for unique service design.

Figure 2-1 – Transit Service Types by Market Area (TPP: Appendix G, Table G-2)

Table G-2: Market Areas - Suggested Service Types

Transit Market Area	Suggested Service Type
Area I	Primary emphasis on regular route service. Downtown area circulators possible.
Area II	Primary emphasis on regular route service. Crosstown routes and limited stop services are appropriate to link major destinations.
Area III	A mix of regular route and community circulator service complemented by dial-a-ride service in specific cases. Community circulators should tie into regular route regional service at a transfer point.
Area IV	Peak period express service, if potential demand for service is sufficient to support at least three peak-period trips. General public dial-a-ride services are appropriate.
Area V	Primary emphasis on general public dial-a-ride services
ADA Paratransit Services	Paratransit service as determined by state and federal regulation. See ADA section of this appendix for additional details.
Transitways	Transitway service is unique to each transitway corridor, and is determined through detailed planning and study unique to individual transitway corridors.

Figure 2-2 – Transit Market Areas



Transit Service Design Standards - TPP: Appendix G also includes transit service design standards that specify a number of key transit service characteristics for different service types. The following service characteristics are included in Appendix G and will be addressed in this memorandum:

- Service span – Service span is the number of hours during the day between the start and end of service on a transit route. The table below, taken from Appendix G of the TPP, outlines the service spans for the various service types in the in the region.

Table G-4: Service Span

Days and Times of Service:	Area I	Area II	Area III	Area IV	Area V
Express	PMENW	PMENW	PME	P	n/a
Urban Radial	PMENOW	PMENOW	PMENW	n/a	n/a
Urban Crosstown	PMENW	PMENW	n/a	n/a	n/a
Suburban Local/ Circulator	PMENW	PMENW	PMENW	n/a	n/a
General Public Dial-a-Ride	n/a	n/a	Up to 18 hours	Up to 14 hours	Up to 14 hours

A trip's service period is determined by the time the route crosses its maximum load point. This standard represents the upper limit of service. For example, owl service is allowable but not required in Area I for an urban local route.

Peak: 6:00am-9:00am and 3:00pm-6:30pm; **M**idday: 9:00am-3:00pm; **E**vening: 6:30pm-9:00pm; **N**ight/Early AM: 9:00pm-1:30am and 5:00am-6:00am and **O**wl: 1:30am-5:00am. **W**eekend is Saturday, Sunday/Holiday. Times do not necessarily correspond with fare structure times.

- Minimum frequency – Service frequency is expressed as the average number of minutes between transit vehicles on a given route or line, moving in the same direction. The table below, taken from Appendix G of the TPP, outlines the minimum frequencies for the various service types in the in the region.

Table G-5: Minimum Frequency

	Area I	Area II	Area III	Area IV	Area V
Express	30" Peak	30" Peak	3 Peak Trips	3 Peak Trips	N/A
Urban Radial	15" Peak/ 30" Offpeak	30" Peak/ 60" Offpeak	60" Peak/ 60" Offpeak	N/A	N/A
Urban Crosstown	30" Peak/ 30" Offpeak	30" Peak/ 60" Offpeak	N/A	N/A	N/A
Suburban Local/ Circulator	N/A	30" Peak/ 60" Offpeak	60" Peak/ 90" Offpeak	N/A	N/A

Additional service may be added as demand warrants. Applies primarily to peak travel direction

- Travel-time competitiveness – Appendix G of the TPP dictates that to be successful in attracting riders who have access to automobiles, transit service must provide travel times that are competitive with comparable auto travel times.

  The recommended travel times are:

  - Local bus travel time should generally not exceed 2.0 times average auto time

- Express bus travel time should generally not exceed 1.35 times average auto time

- Network transfer connectivity – Appendix G of the TPP identifies transit network connectivity as the ability to travel anywhere the transit network reaches with minimal waiting time for transfers between the trips. Ideally, all transfers are designed to occur within five to 15 minutes at the transfer point. In specific situations where connections are less than five minutes, times transfers should be arranged with specific transit operator instructions to "meet" the other bus.

2.2.3.2. City and County Transit Plans

The Metropolitan Land Planning Act requires local governments to update their comprehensive plans every ten years. The Metropolitan Council must review these local plans to ensure they are in compliance with regional system plans. Every city and county in the seven-county metro area must have a Council-approved transit system policy plan that is in conformance with metropolitan system plans.

Some cities and counties have taken the additional step of including items in their comprehensive plans that are "above and beyond" the regional system plans. For example, the City of Minneapolis developed a ten-year transportation action plan, *Access Minneapolis*, in order to identify specific actions that the City and its partner agencies (Metro Transit, Metropolitan Council, Hennepin County, and Minnesota Department of Transportation (Mn/DOT) need to take within the next ten years to implement the transportation policies articulated in the City's comprehensive plan. An important component of *Access Minneapolis* is the Primary Transit Network.

The Primary Transit Network is a network of transit services the City, through working partner agencies, intends to establish and maintain as a permanent network of frequent, all-day service at a finer grain than what is currently available. The long-term goals for Primary Transit Network services include frequency and span improvements (operate every 15 minutes or better at least 18 hours a day), faster travel time (not less than 30 percent of the speed limit), increased reliability, appropriate seating capacity, and enhanced coverage (most residents should be within ¼ mile of Primary Transit Network services).

It is important to acknowledge that this memorandum is focused on guidelines for transitway development at the regional level. Local initiatives such as Minneapolis' Primary Transit Network may go "above and beyond" the Council's transit plans as long as they are consistent with Council policies.

2.2.3.3. American Public Transit Association Standards

The American Public Transit Association (APTA) Standards Development Program has released draft recommended practices for BRT service design. The report gives a thorough overview of span, frequency, and approaches to scheduling and operations for successful systems throughout North America. The scope of the recommended practices includes routing, service hours and frequencies, and service issues as they generally relate to various BRT implementation approaches. The following are key conclusions from the document:

- BRT service standards should be similar to standards for rail rapid-transit modes, especially where rail and bus modes connect.

- BRT service design can be more flexible than other rapid services and the inclusion of branches, short lines, and overlaid express services should be explored to maximize the ability of the service package to match demand.

- Span of service – Span of service should replicate comparable rapid-transit systems (LRT, subway, etc.) so as to not seem inferior or confusing to user. Span of service is dependent on location, however, with full service implementation being more warranted in built-up areas and incremental service implementation more appropriate for outlying or developing areas.

- Weekend service is commonly provided and in the absence of weekend service, comparable local service should be provided to match other regional rapid-transit systems.
- Typical spans of service in North America are 18 to 20 hours per day but a 14-hour minimum on weekdays should be standard to align with FTA Small Starts requirements.

- Frequency of Service – Frequencies on BRT systems should be coordinated with other rapid-transit lines and for conventional transit services. Common policy levels are frequency minimums that typically apply to off-peak times and peak frequencies generally exceed the minimums.
  - Frequency of service is integrally linked with demand and vehicle capacity (or service/load standards). Load standards also affect vehicle size, which is also linked to frequency requirements. It may be appropriate to develop frequency standards in conjunction with coordinating load standards.
  - Typical frequencies of service in North America are five to ten minutes in the peak and ten to 15 minutes in the midday. Minimum frequencies of ten minutes in the peak and 15 minutes in the off-peak should be standard to align with Small Starts requirements.

2.3. EXISTING CONDITIONS

2.3.1. Existing Conditions in Other Regions

APTA's Recommended Practices for BRT Service Design draft report includes examples of span of service and weekday frequency of service for many BRT systems in North America, which helped inform the committee's work as recommended guidelines were drafted.

Council staff have done additional research regarding BRT, including in-depth interviews with planning staff that implemented BRT services in New York City (Select Bus), Cleveland (HealthLine), and Kansas City (MAX). These interviews were supplemented with online date for systems including Los Angeles (Metro Rapid), Las Vegas (ACE), and Oakland (Rapid). This research has helped the Service Operations Technical Committee develop reasonable guidelines for travel time savings, ridership, service frequency, and accommodation of other services in BRT corridors.

Table 2-1 summarizes the results of our national research. On average, BRT service is about 24 percent faster than the local service that operated in the same corridor before BRT was implemented. After BRT service is implemented, it is generally 18 percent faster than the remaining local service operating in the same corridor. There is a 28 percent increase in ridership in these corridors.

Table 2-1 – BRT Services in Other Regions

	Los Angeles-Wilshire Whittier	Los Angeles-Ventura	New York -Bx12 Select Bus	Cleveland-HealthLine	Kansas City-MAX	Las Vegas-ACE	Oakland
Percent Improvement in BRT Travel Time Compared to Pre-BRT Local Service	29%	23%	19%	24%	N/A	N/A	N/A
Percent Improvement in BRT Travel Time Compared to Post-BRT Local Service	27%	21%	13%	3%	17%	N/A	21%
Weekday Ridership	10,100		44,000	14,200	4,200		6,100
Peak Frequency	5 min.	5 min.	3-4 min.	5 min.	9 min.	10 min.	12-15 min.
Off-Peak Frequency	7.5-10 min	20 min.	7.5 min.	10-15 min.	15-30 min.	15 min.	15-20 min.
% Change in Corridor Ridership	27%		7%	40%	50-80%	27%	16%
Weekday Span	15 hrs		18 hrs	24 hrs	20 hrs	16 hrs	14 hrs

N/A means there is no local service operating in the same corridor either pre- or post-BRT

2.3.2. Services Currently in Operation in the Twin Cities

The follow section summarizes the services currently in operation in the region, as related to the Service Operations Guidelines.

2.3.2.1. Local Service

Local transit service is available throughout the region with varying service characteristics to match the local transit demand and market area needs. A local route, which is defined as a single route on local, collector or minor arterial streets with frequent stops (1/8 to 1/4 mile) and basic infrastructure, can operate in either urban or suburban markets. Local service is used as the benchmark for Arterial BRT, Highway BRT station-to-station, and LRT modes because these types of transitways are designed to operate in similar medium to high-density environments, serve similar all-day markets, and have more frequent stops than express services.

There is a subset of local routes known as the Hi Frequency Network, which includes 12 routes with service so frequent that passengers do not need to rely on a pocket schedule. Parts of routes 5, 6, 10, 18, 19, 21, 64, 84, 515, and all of routes 16, 54 and 55 (Hiawatha LRT) are included. These routes operate every 15 minutes (or better) on weekdays between 6:00 a.m. and 7:00 p.m. and on Saturdays between 9:00 a.m. and 6:00 p.m. These routes are the system’s best performers, carrying over half of all local passenger trips.

2.3.2.2. Express Service

Express service is generally available for trips starting farther from the core destinations of downtown Minneapolis, downtown St. Paul, and the University of Minnesota. An express route must travel at least four miles non-stop and is generally a single route with transit advantages (bus-only shoulders, ramp meter bypass, etc). Most express routes are supported by one or more park-and-ride facilities that are accessed by passengers in private vehicles. Express bus service is used as the benchmark for Highway BRT express and Commuter Rail modes because these types of transitways are designed to operate in similar low- to medium-density environments, serve similar peak-only markets, and have far fewer stops than local services.

2.3.2.3. Light-Rail Transit (LRT)

There is currently one LRT in operation in the region, the Hiawatha Line. It travels between downtown Minneapolis, the international airport, and the Mall of America in Bloomington, primarily paralleling Trunk Highway 55. The Hiawatha Line currently operates with a span of approximately 22 hours on weekdays and weekends. The frequency of trains on weekdays is approximately five to ten minutes during the peak period, ten minutes during the midday, and 15 minutes during the evenings. Weekend frequencies are approximately ten to 15 minutes. There are no short line or branch operations on the Hiawatha LRT and trains stop at every station along the transitway.

2.3.2.4. Commuter Rail

The only Commuter Rail in operation or implementation in the region is the Northstar Line, which opened in November 2009. The Northstar Line currently operates five to six peak trips on weekdays (generally five trips inbound trips and one outbound trip in the AM peak and five outbound trips and one inbound trip in the PM peak) from Big Lake to Target Field in Minneapolis. Metro Transit also operates three trips on Saturday and Sunday in the morning and afternoon and provides some special event service to Target Field. All trips serve all six Northstar Line stations.

2.3.3. Planned Expansion in the Twin Cities

2.3.3.1. Light-Rail Transit (LRT)

There are two LRT lines in the advanced planning stages where a locally preferred alternative (LPA) has been selected and adopted by the Metropolitan Council. Central Corridor LRT will connect downtown Minneapolis, the University of Minnesota, University Ave, the Capitol building, and downtown St. Paul. Construction is underway and the line is expected to open in 2014. The Southwest LRT will connect Minneapolis and the southwest suburbs, including Hopkins, St. Louis Park, Minnetonka, and Eden Prairie. It is planned to open in 2017, pending state and federal funding.

Central Corridor - The Central Corridor LRT service assumptions from the May 2010 New Starts FFGA for weekday service are 7.5-minute frequency for peak, ten-minute frequency for midday, 15-minute frequency for early morning and evening, and 30-minute frequency for late night. The proposed span of service for weekdays is 20 hours.

Weekend service assumptions are similar with ten-minute midday frequency, 15-minute morning and evening frequencies, and 30-minute late night frequency. The proposed span of service is also 20 hours for weekends.

Southwest Corridor LRT - The Southwest LRT service assumptions from the August 2010 New Starts preliminary engineering application for weekday service are 7.5-minute frequency for peak and ten-minute frequency for off-peak. The proposed span of service for weekdays is 20 hours.

Weekend service assumptions are similar with 10-minute midday frequency, 15-minute morning and evening frequencies, and 30-minute late night frequency. The proposed span of service is also 20 hours for weekends.

2.3.3.2. Bus-Rapid Transit (BRT)

There are currently two Highway BRT lines in the implementation phase in this region, Cedar Avenue BRT and I-35W South BRT.

Cedar Avenue BRT - Transit service is this corridor consists of a combination of station-to-station bus service and express bus service. For 2012 implementation, station-to-station service serving stations in Bloomington, Eagan, and Apple Valley is proposed at ten-minute frequency during the peak and 15-minute frequency during the midday, with every other bus continuing to stations in Lakeville (equating to 20-minute and 30-minute frequencies in Lakeville, respectively). The proposed frequency for weekday evening, Saturday, and Sunday service is 30-minute. The span of service for station-to-station is 18 hours on weekdays, 15 hours on Saturday, and 12 hours on Sunday.

Proposed express buses frequencies in 2012 in the transitway vary by station served and demand and capacity constraints. For instance, express service from Apple Valley Transit Station is proposed at 22 trips each peak period to downtown Minneapolis while express service from Lakeville Cedar is proposed as five trips each peak period. Many of the express bus routes include local tails in the community where passengers board before the bus begins traveling on the transitway.

Modeling results for the proposed services in year 2030 also indicate a 25 percent improvement in travel time over existing bus travel times for the station-to-station service from Apple Valley Transit Station to Bloomington.

I-35W South BRT - Transit service in this corridor consists of a combination of station-to-station bus service and express bus service. For 2012 implementation, station-to-station service will serve seven stations in Burnsville, Bloomington, Richfield, and Minneapolis. Station-to-station service will operate at 15-minute frequencies all day, with an 18-hour span of service. Future phases will introduce weekend station-to-station service, additional online stations for faster travel time, and improved frequency.

Express service in the corridor carries over 10,000 daily passengers (2009) on over 500 daily trips in the corridor, and includes express service from the Cedar Avenue transitway. Existing express service includes frequent routes serving local tails as well as large park-and-ride lots. Future express service will add new routes and facilities and will improve frequency on existing routes.

The completed runningway infrastructure in the I-35W South BRT corridor allows reliable and congestion-free travel for buses. A future extension of this runningway is programmed in the northbound direction from I-35 to Burnsville Parkway.

2.4. SERVICE OPERATIONS GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff the following Service Operations Guidelines are recommended for adoption. These guidelines are important to frame the region's expectations for service levels during the development phase of a transitway project, to ensure that transitway service meets the greatest number of travel demands in a corridor in a cost-effective manner, and to provide consistent service design across transitways. The guidelines are summarized in Table 2-2. These guidelines should be considered collectively when making service operations decisions for transitways. The guidelines are summarized and discussed below.

2.4.1. Service and Network Design Definitions

Transitway travel time, access, service frequency and span, and reliability make transitway service attractive. Based on these factors, transitway service can be categorized into one of two groups: all-day frequent service or commuter express service. Within these categories, there are five transitway service types defined in Table 2-2 and the remaining Service Operations Guidelines (and some guidelines in other topic areas) specify the expectations for these service types. The five transitway service types are:

- *Arterial BRT*
- *Highway BRT station-to-station*
- *Highway BRT express*
- *LRT*
- *Commuter Rail*

Table 2-2 includes service and network design definitions for the various transitway services.

These definitions are meant to help frame the understanding of which services are and are not included in the transitway and the subsequent guideline discussions. For instance, an express bus route that is not coordinated with station-to-station service, but runs in a BRT corridor, would not be a Highway BRT express service, but would operate within other guidelines established for standard express service in the region.

2.4.2. Route Structure

The structure of routes in a transitway is important to allow for both service planning flexibility and customer convenience and plays an important role in overall service delivery. Appropriate transitway services include the trunk (or short line) and branch portions of the transitway, as long as all segments meet Guidelines on service frequency, span, facilities, and runningway. Local tails are strongly discouraged on all bus transitway services except Highway BRT express.

The trunk portion of a transitway offers the highest frequency of service with stations and a runningway that meet transitway minimums. The frequency of service on route branches must satisfy transitway minimums, but do not necessarily have to meet the same level of service as the trunk portion.

The infrastructure requirements of branches and local tails can limit transitway modes. For instance, LRT and Commuter Rail will never have local tails because trains cannot turn off the rail corridor onto local streets. Similarly, branches on an LRT line are unlikely because they would require significant investments in runningway infrastructure. However, if the ridership and cost/benefit analysis justifies the expenditure, they may be acceptable. In other cases, local tails through neighborhoods are strongly discouraged on Arterial BRT and Highway BRT station-to-station services. These are designed to be premium services, and having a part of the Arterial BRT or Highway BRT station-to-station making stops every 1/8 mile to 1/4 mile at bus stops without amenities or transit advantages lowers the quality of service and expectations of a transitway.

2.4.3. Coordination of Transit Service

It is important to coordinate transfers between transit services to increase accessibility and improve the function of the transit network. In all instances, transitway operations should work together with connecting local services at stations. In transitways where different service types operate in conjunction with each other, these services should be coordinated to facilitate convenient and reliable transfers.

To allow for reliable connections, the waiting time between a transitway and a route that is designed to make a connection should be five to 15 minutes.

In order for a connection to be a priority, a significant portion of riders should be making the transfer.

Transitways need to be coordinated with other services sharing the same right-of-way. For example, Commuter Rail schedules need to mesh with freight and Amtrak or other passenger rail, and the trip times for Highway BRT station-to-station service must be planned in conjunction with Highway BRT express and other express service at common stops. Also, it is important to coordinate different local tails on Highway BRT express.

The relationship between Arterial BRT and local service can vary depending on the individual corridor. In some cases, Arterial BRT functions as an overlay to the local service, with Arterial BRT serving as the primary service and the local service playing a supporting role. In other areas, Arterial BRT may completely replace local service, depending on the bus stop spacing and route geography. Investments made in runningway or amenities for an Arterial BRT service will also benefit local services.

2.4.4. Complementary and Competing Routes

Transitway service planners should identify existing or planned transit routes that compete with transitway service and consider consolidation.

Whether an existing route is duplicative or an enhancement depends on the travel patterns in the transitway corridor. A complementary route can serve the same *locations* as the transitway but has a significant difference in travel time, frequency, and/or accessibility. However, a competing route serves the same *market* as the transitway and has no significant difference in travel time, frequency, and/or accessibility. For example, in the Central Corridor transitway, the planned LRT service would compete against existing Route 50 limited stop service, but the existing Route 94 express service is complementary because the travel time between downtown Minneapolis and downtown St Paul is much faster and there is only one stop in between the downtowns.

2.4.5. Minimum Frequency

> *Minimum frequency thresholds are meant to establish a consistent service expectation regarding how often the service operates for customers throughout the transitway network. Transitway service frequencies should consistently meet minimum thresholds identified in Table 2-2 to allow customers to establish and maintain service frequency expectations for each type of service.*

The guidelines are based on existing services in the region, federal Small Starts and Very Small Starts requirements, and research from other transit systems. The frequency standards outlined in the guidelines for Arterial BRT and LRT are consistent with Metro Transit's Hi-Frequency Network standards. These standards help emphasize the "use without a schedule" concept that allows a level of confidence for the transit rider that the wait for the next bus/train will not be significant.

It is important to understand that frequency standards on Highway BRT station-to-station and Arterial BRT can be achieved by combining the frequencies of coordinated routes on a mainline trunk. For example, the Arterial BRT standard of 10-minute service during peak periods can be satisfied either by an Arterial BRT route that operates every 10 minutes or by a combination of 20-minute local and 20-minute Arterial BRT services that results in a combined 10-minute frequency at Arterial BRT stations. The Highway BRT station-to-station off-peak standard is 15-minute combined service.

The minimum frequency guidelines outlined in Table 2-2 refer to the number of trips per hour and may not necessarily be evenly spaced (i.e. four trips per hour = 15-minute frequency). Service planning should strive to achieve a balanced frequency with combined services, when possible. Service levels on the fringe of a time period may differ slightly from the standard. These guidelines apply primarily to the peak direction of service. The availability of reverse commute service depends on market demand and is not included in these guidelines.

2.4.6. Minimum Span of Service

> *Minimum span of service thresholds establish a consistent service expectation regarding the days of the week and hours of the day service is available for customers throughout the transitway network. Transitway service span should consistently meet minimum thresholds identified in Table 2-2 to allow customers to establish and maintain expectations for the days and hours of operation for each type of service.*

The guidelines are based on existing services in the region, federal Small Starts and Very Small Starts requirements, and research from other transit systems. The span of service standards outlined in the guidelines for Arterial BRT and LRT are consistent with Metro Transit's Hi-Frequency Network standards.

The guidelines mandate that all transitways should operate on weekdays. Arterial BRT and LRT services should also offer Saturday and Sunday service. Weekend service on Highway BRT station-to-station, Highway BRT express and Commuter Rail depends on market demand and whether local service is available in the same general corridor. For example, Cedar Avenue BRT plans to operate weekend service because there is no other local service in most parts of the corridor, while the I-35W South BRT line may not initially have weekend service until demand can be demonstrated and since there is complementary local service paralleling I-35W.

These guidelines are intended to be the minimum levels. Ridership, passenger loading standards, and service connectivity will help determine span above the minimum levels.

2.4.7. Travel Time

Transitway travel times should be competitive with travel times for pedestrian, bicycle, auto, local bus, and/or express bus modes, depending on the travel markets served. Travel times should at least meet thresholds identified in Table 2-2.

Transitway projects in the planning phases that do not offer a significant improvement in travel time compared to existing service in the corridor should be reconsidered. For new transit markets, the primary comparison mode would be auto travel times, but comparable local routes in other corridors could also be used to determine travel time competitiveness for frequent, all-day service options. For existing express markets, existing transit travel times should be the primary comparison mode.

One of the main attractions for transitway services is the faster average travel time, in comparison to traditional local and express buses. All forms of transit compete against the single-occupant vehicle (SOV). All transit service should have a competitive travel time but transitways need to be even more competitive. Appendix G of the Transportation Policy Plan (TPP) includes travel time competitiveness guidelines for local and express bus. It states that local bus travel time should not exceed 2.0 times average auto time, while express bus travel time should not exceed 1.35 times average auto time. Service planners should use these guidelines as benchmarks to measure travel time on transitways.

Research of other BRT systems in the U.S. found that the average travel time for BRT service is 18 percent faster than on post-implementation local service in the BRT corridor. The travel time for BRT compared to the pre-implementation local service is 24 percent faster.

2.4.8. Average Productivity

Transitway average productivity should be identified during service planning and design and monitored during operation. It should meet or exceed minimum thresholds identified in Table 2-2 to ensure each line's level of service is appropriately matched to the demand of the travel market(s).

Productivity, or the number of passengers served per hour, is an indicator of how effectively a transitway is performing. Appendix G of the TPP includes an average and a minimum guideline for LRT and regular bus service. The minimum productivity is intended to be a general guideline but individual hours will not be held rigidly to the standard.

2.4.9. Maximum Acceptable Loading Per Transitway Vehicle

Transitway service plans should be designed to limit the number of standees to the maximum thresholds identified in Table 2-2, if any, for any time during daily operations.

Maximum acceptable loading standards outline a desired range of passengers per vehicle and an acceptable amount of standees. These guidelines help determine whether a bus or train is overloaded and if an appropriate level of frequency is being provided on a transitway. Appendix G of the TPP includes load standards during peak and off-peak times for express bus, local bus, and LRT by transit market area.

Because loading standards are based on the number of seats, a higher load factor may be acceptable for Arterial BRT and Highway BRT station-to-station if the transitway vehicles are not designed to maximize seating capacity. Commuter transitway modes, such as Highway BRT express and Commuter Rail, should not have passengers standing due to the long average trip length or traveling conditions. Commuter Rail can have a 200 percent loading standard for special events.

2.4.10. Transitway Market Areas

Transitway service types should be appropriately matched to transit market demand areas established in the Transportation Policy Plan and listed by mode in Table 2-2.

The TPP outlines the types of local and express services appropriate for the various Transit Market Areas in the region. Using local bus as the benchmark, the same standard for Arterial BRT, Highway BRT station-to-station, and LRT is recommended: these services are appropriate for market areas 1, 2 and 3. Highway BRT express is similar to express service in terms of market-area characteristics. Highway BRT express is best suited for market areas 2, 3, and 4. Non-downtown Commuter Rail stations are generally only appropriate in market areas 3, 4, and 5 per the Station Spacing and Siting Guidelines, but a market-area specific analysis may be done to justify the viability of a station within market area 2.

Table 2-2 – Service Operations Transitway Guidelines

The primary objective of service operations on a transitway is to be fast and reliable. There are two types of transitways: frequent service operates bi-directionally all day; commuter express service primarily operates in the peak travel direction during peak periods. Transitways have four dimensions of convenience (speed, reliability, availability/frequency and access) that each play an important role in how a transitway functions. Differences in speed and access between transitway modes are the result of the service and network design and strongly impact service operations. Speed is determined by transit advantages such as runningway and technology, fare collection, and station spacing. Access is also defined by station spacing. Various transitway modes trade-off varying levels of speed, frequency, and access, but the reliability of a transitway is a constant that cannot be compromised. Speed, frequency, and access need to be coordinated or balanced within the "family of services" in a corridor.

	Local Service (Benchmark)	All-Day Frequent Service			Express Service (Benchmark)	Commuter Express Service	
	Local Bus/Limited Stop	Arterial BRT	Hwy Bus-Rapid Transit (BRT) Station-to-Station	Light-Rail Transit (LRT)	Express Bus	Hwy Bus-Rapid Transit (BRT) Express	Commuter Rail
2.4.1. Service definition and network design	A single route defined by frequent stops (1/8-1/4 mile) and basic infrastructure	A single route within a coordinated corridor defined by neighborhood-scale infrastructure	A coordinated set of routes that stop at all or most stations in the Highway BRT corridor and all associated stations and runningway infrastructure	A single route and all associated stations, track and infrastructure	A single route with transit advantages	Express routes coordinated with station to station service, using at least one corridor station, runningway and park & rides	A single route and all associated stations and infrastructure
2.4.2. Route Structure	Branches and short lines are acceptable and are an important part of the route structure.	Short lines are acceptable. Branches are acceptable if each branch meets all Arterial BRT standards. Tails operating as local service through neighborhoods are strongly discouraged.	Branches and short lines are acceptable. Local tails are discouraged.	Short lines are acceptable. Branches are unlikely but could be acceptable if justified by ridership.	Short lines, branches and local tails are acceptable.	Short lines, branches and local tails are acceptable.	Short lines are acceptable. Branches are most likely the result of two rail lines sharing a common section.
2.4.3. Transit Services Coordination	Transfers with connecting services	Coordination with local service in the same right-of-way; transfers with connecting services	Coordination with express bus in same highway corridor; transfers with connecting services	Coordination with other rail services in corridor; transfers with connecting services	Transfers with connecting services and local tails	Coordination with station-to-station in same highway corridor; transfers with connecting services and local tails	Coordination with other rail services; transfers with connecting services
2.4.5. Minimum Frequency	Varies by Transit Market Area served and route type	*WEEKDAY* 10-min. peak period, 15-min. midday/evening, 30- to 60-min. early/late *WEEKEND* 15-min. day/evening, 30- to 60-min. early/late	Combined frequency for the station-to-station and express services should be 10-min. peak period and 15-min. midday. These frequencies apply only to the combined frequency of coordinated routes on the mainline trunk portion of the transitway.	*WEEKDAY* 10-min. peak period, 15-min. midday/evening, 30- to 60-min. early/late *WEEKEND* 15-min. day/evening, 30- to 60-min. early/late	30-min. in Transit Market Areas 1 and 2. 3 trips each peak period in Transit Market Areas 3 and 4	30-min. in Transit Market Areas 1 and 2. 3 trips each peak period in Transit Market Areas 3 and 4	30-min. peak period. Off-peak frequency to be determined as needed.
2.4.6. Minimum Span of Service	Varies by Transit Market Area served and route type	7 days a week, 16 hours a day	Weekdays, 14 hours a day on trunk portion	7 days a week, 18 hours a day			Weekdays, 5 trips each peak period
2.4.7. Travel Time	Baseline	Should be at least 20% faster than local bus	Should be at least 20% faster than local bus	Should be at least 20% faster than local bus	Not more than 35% slower than auto	Not more than 35% slower than auto.	Not more than 35% slower than auto; Competitive with express bus.
2.4.8. Average Productivity	20 passengers per in-service hour	20 passengers per in-service hour	20 passengers per in-service hour	70 passengers per in-service hour	20 passengers per in-service hour	20 passengers per in-service hour	70 passengers per in-service hour
2.4.9. Maximum Loading Standards[1]	Peak Period 125% Off-Peak 100%	Peak Period 125% Off-Peak 100%	Peak Period 125% Off-Peak 100%	200% Peak Period and Off-Peak	100% Peak Period and Off-Peak	100% Peak Period and Off-Peak	100% Peak Period and Off-Peak 200% Special Events
2.4.10. Market Area	1,2,3	1,2,3	1,2,3	1,2,3	2,3,4	2,3,4	3,4,5

Competing Routes
Transitways offer higher travel speeds but fewer access points. Therefore, routes that serve the same locations but have significant differences in travel time, frequency or accessibility may be complementary to a transitway, depending on a corridor's travel patterns. Other routes serving the same market as the transitway in the same manner are considered to be competing routes and should be considered for consolidation. A transitway project that does not offer a significant improvement in travel time compared to the existing service should be reconsidered.

Transfers
Scheduled connections between transit services increases access and improves the function of the network. The waiting time between a transitway and routes specifically designed to connect should be between 5 and 15 min to allow for reliable connections. In order to prioritize a connection, a significant percentage of riders on the bus or train at that time should be transferring.

Frequency and Time Periods
Frequency is expressed as the number of trips per hour and the trips may not necessarily be evenly spaced. Peak period is the 1 to 3 hour period of highest ridership in the AM and PM. Midday is 9:00am-3:00pm. Evening is 6:30pm-9:00pm. Early is 5:00am-6:00am and Late is 9:00pm-1:30am. Service levels on the fringe of these periods may differ slightly from the standard. These guidelines apply primarily to the peak direction of service; the availability of reverse commute service depends on market demand.

1 Loading standards are based on a standard vehicle design maximized for seating capacity. Higher load factors may be acceptable if vehicles are specifically designed to have a higher ratio of standees to seats.

3. STATION SPACING AND SITING

3.1. INTRODUCTION

3.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway station spacing and siting through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the remainder of this chapter is organized the following sections:

- Relevant background information including applicable laws and regional policies
- Existing conditions in the region and in other regions
- Guidelines recommended through the technical development process

3.1.2. Committee Purpose

The purpose of the Station Spacing and Siting Technical Committee was to draft guidelines for use in identifying general transitway station areas and the specific parcels on which transitway stations should be located. These guidelines are meant to frame the region's expectations of appropriate frequency and type of access along transitways and the discussion of where access is best provided. These guidelines will promote a transitway's ability to provide competitive, reliable travel times while meeting the corresponding transportation needs and complementing the community development objectives identified in a corridor.

3.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the Station Spacing and Siting Technical Committee discussion include Arterial Bus-Rapid Transit (BRT), Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

3.2. BACKGROUND INFORMATION

3.2.1. Definitions

The following section defines terms applicable to the Station Spacing and Siting Guidelines.

<u>Station/Stop-Related Definitions</u> -

Transit stop – A transit stop is any location that a bus is regularly scheduled to stop, however, the bus is not required to stop if there is no passenger demand on a trip. The physical infrastructure and amenities at a transit stop are often minimal.

Transit shelter – A transit shelter can be standard or custom based on passenger demand and is a transit stop that consists of greater amenities including a structure with a roof. As noted in Appendix G of the *Transportation Policy Plan* (TPP), transit shelters with higher daily passenger volumes occasionally include amenities such as lights, heaters, passenger seating, security cameras, or electronic customer information displays, in addition to the roofed structure.

Transit center (sometimes referred to as a "hub") – A transit center is a place where two or more local bus routes make scheduled connections. Transit centers typically serve higher daily passenger volumes as compared to transit stops and have greater investment in the physical infrastructure and amenities. Examples of amenities include those available at shelters (e.g., lights, heaters, passenger seating, security cameras, and customer information displays, as well as larger, more substantive, enclosed buildings).

Transitway station – A station is a place on a transitway where scheduled vehicles stop during every trip. Because of the higher daily passenger volumes served as compared to some transit stops, stations typically include greater investment in the physical infrastructure and amenities as compared to a transit stop. Examples of amenities include those available at shelters (e.g., lights, heaters, passenger seating, security cameras, and customer information displays, as well as ticket vending machines). There are three categories of transitway stations as illustrated in Figure 3-1:

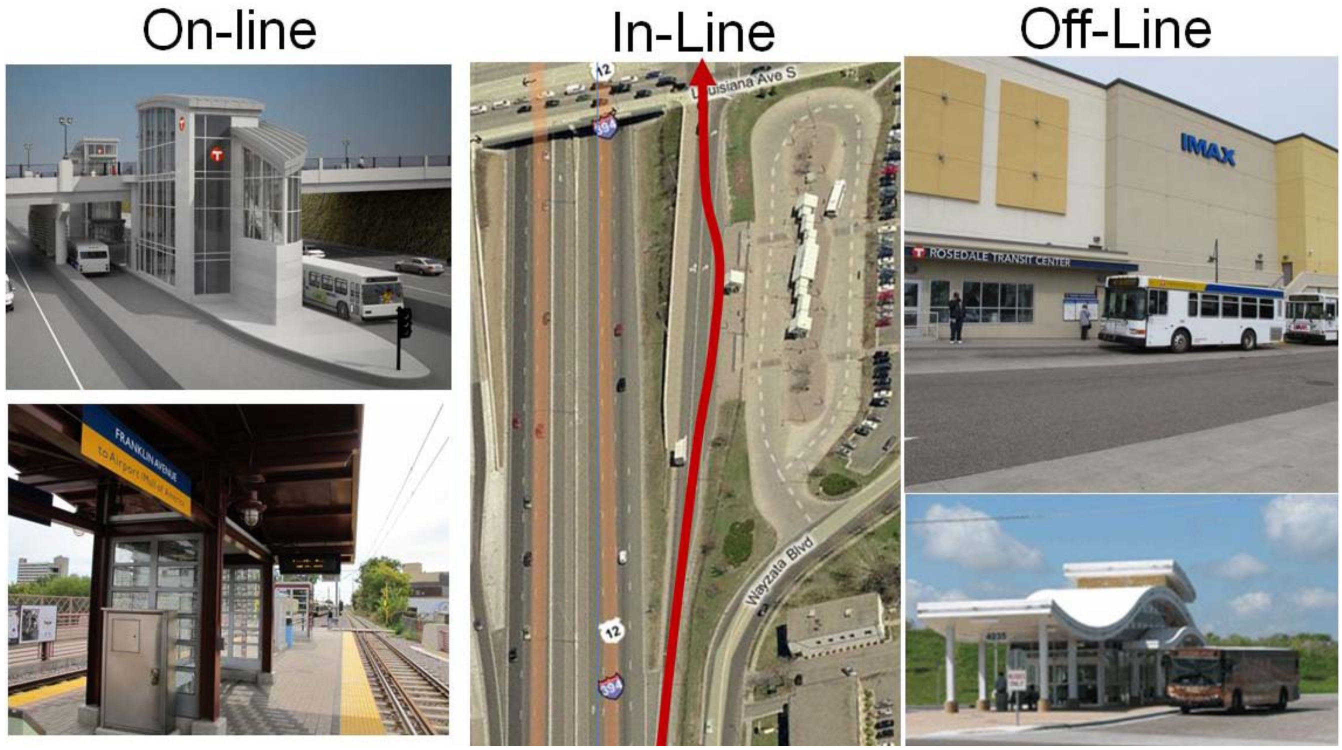
- *Online station* – Online stations are located within the vehicle runningway and the transitway vehicle can access them without leaving the runningway. Online stations are important elements of transitway service speed, reliability, and accessibility. Examples of online stations include all LRT and Commuter Rail stations, the I-35W South/46th Street Station, and the Apple Valley Transit Station on Cedar Avenue.
- *Inline station* - Inline stations are located immediately adjacent to the vehicle runningway, typically along freeway interchange ramps. Although they require the vehicle to exit the primary runningway, they provide a fast access opportunity and immediately return to the runningway. Few or no turn movements are required. Examples include the I-35W South BRT stations at 66th Street and future stations at 82nd and 98th streets.
- *Offline station* – Offline stations support transitway accessibility and ridership, but require transitway vehicles to exit the runningway and require several turning movements and potential traffic delays that impact transitway service speed and reliability, especially during peak travel times. Examples of current offline stations are the Cedar Avenue BRT Cedar Grove Transit Station and Burnsville Transit Station.

A transitway station may be included in one or more of the categories. For example, the I-394 Louisiana Avenue station is an inline station or inbound trips going to Minneapolis, as illustrated in Figure 3-1, but offline for outbound trips.

Central Business District - For the purposes of the Regional Transitway Guidelines for Station Spacing and Siting, the central business district (CBD) is defined as the downtown center of commercial activity in the cities of Minneapolis and St. Paul. While many cities have a defined CBD, Minneapolis and St. Paul CBDs are unique because of their higher population and employment densities and lower levels of auto ownership, which puts them in transit market area 1 as defined in the TPP Appendix G and described in section 3.4.1 of this document.

Existing Condition - A condition may be considered existing if it is present at the time of transitway planning or imminent as evidenced by the presence of critical, supporting infrastructure or a contractual agreement.

Figure 3-1 – Transitway Station Types



3.2.2. Existing Laws and Regulations

The following section summarizes the existing laws and requirements that are relevant to the Station Spacing and Siting Guidelines.

Title VI - Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color and national origin for any program that receives federal funding. Federal funding typically plays a significant role in transitway planning and development and therefore all aspects of transitway projects must comply with Title VI.

Federal Transit Administration (FTA) Requirements - Some transitways may be eligible for federal funding. While there are several federal funding mechanisms there are three primary FTA programs including New Starts, Small Starts, and Very Small Starts. In order to be eligible for the three primary transitway federal funding programs, transitway projects must meet FTA performance criteria as appropriate for the grant type.

3.2.3. Existing Regional Policy

Several existing regional policies are relevant to the Station Spacing and Siting Guidelines. In some cases, transitways are not explicitly called out in the existing regional policy, but the policy provides important benchmark information from which guidelines can be developed for transitways.

3.2.3.1. 2030 Transportation Policy Plan (TPP)

The region's long-range transportation plan, the TPP, includes several sections that address or relate to transitways. Chapter 4: Transportation and Land Use and Chapter 5: Regional Mobility outline regional policies that relate to transit, transitways, and coordination with the broader transportation network. Chapter 7: Transit is the long-range transit plan for the region. It outlines policies and plans for the future transit system, including development of transitways.

Appendix G: Regional Transit Standards is another important section that presents tools for helping transit planners and policy-makers understand the transit market and market potential. Several planning and operational standards are identified in the appendix and provide a strong basis for developing transitway guidelines. The standards relevant to the Station Spacing and Siting Guidelines are summarized below.

Service type by market area – Figure 3-2, taken from the TPP Appendix G, identifies transit service types best suited for different transit market areas. The market areas in the 7-county metro area are illustrated in Figure 3.3The primary factors in identifying these market areas are population and employment density and auto ownership. The TPP also acknowledges that transitways are unique transportation corridors with specific, detailed planning processes that result in appropriate levels of service for specific corridors. The detailed planning work on transitway corridors leads to unique applications of transit service design standards and specific types of service unique to each corridor.

Bus stop spacing by service type – Appendix G of the TPP recommends the following bus stop spacing, noting that an allowable exception to the standards may be CBDs and major traffic generators.

The recommended guidelines are:

- Six to eight stops per mile for local service
- One to two stops per mile for limited-stop service

Travel time competitiveness with auto – Appendix G of the TPP dictates that to be successful in attracting riders who have access to automobiles, transit service must provide travel times that are competitive with comparable auto travel times.

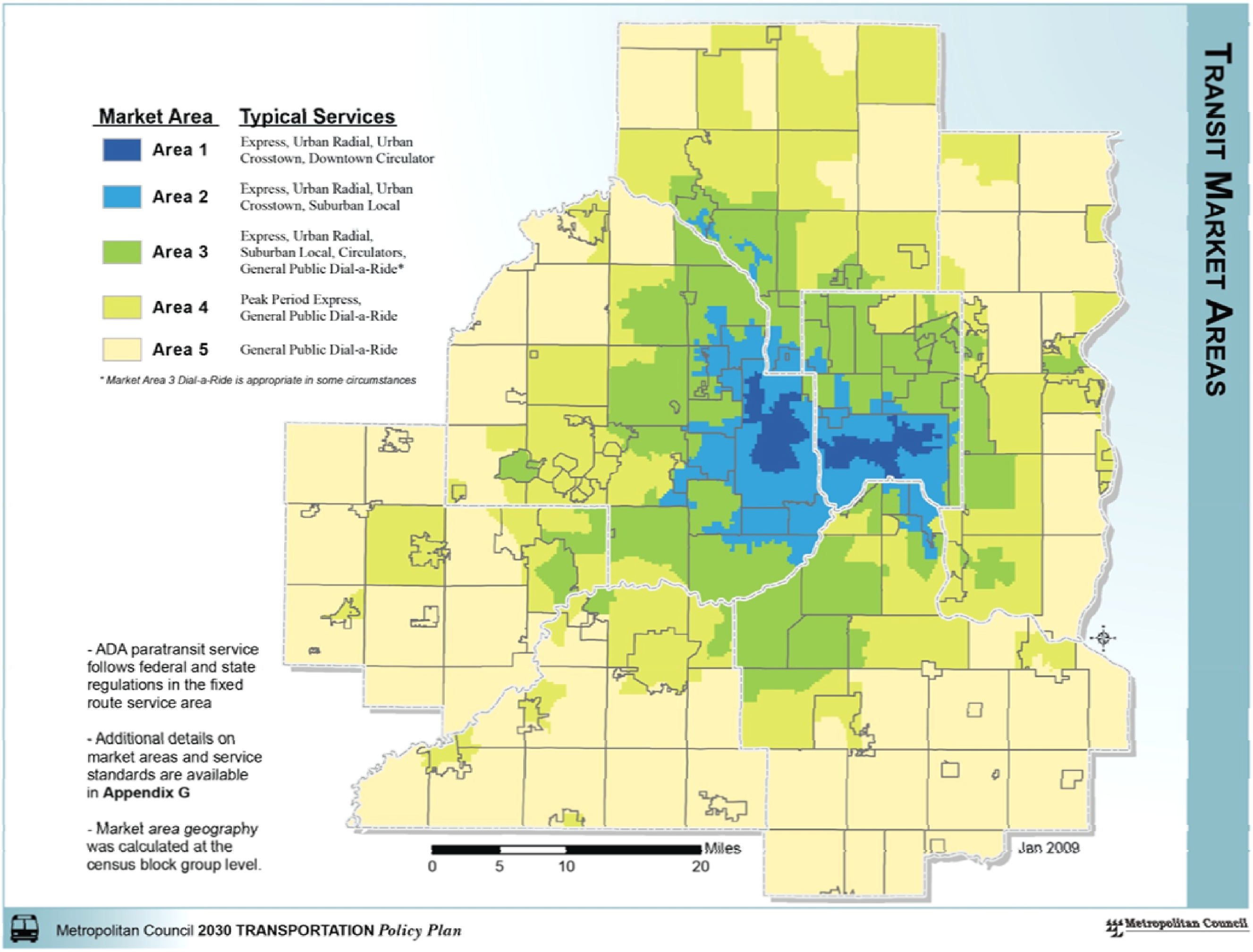
The recommended travel times are:

- Local bus travel time should generally not exceed 2.0 times average auto time
- Express bus travel time should generally not exceed 1.35 times average auto time

Figure 3-2 – Transit Service Types by Market Area (TPP Appendix G Table G2)

Transit Market Area	Suggested Service Type
Area I	Primary emphasis on regular route service. Downtown area circulators possible.
Area II	Primary emphasis on regular route service. Crosstown routes and limited stop services are appropriate to link major destinations.
Area III	A mix of regular route and community circulator service complemented by dial-a-ride service in specific cases. Community circulators should tie into regular route regional service at a transfer point.
Area IV	Peak period express service, if potential demand for service is sufficient to support at least three peak-period trips. General public dial-a-ride services are appropriate.
Area V	Primary emphasis on general public dial-a-ride services
ADA Paratransit Services	Paratransit service as determined by state and federal regulation. See ADA section of this appendix for additional details.
Transitways	Transitway service is unique to each transitway corridor, and is determined through detailed planning and study unique to individual transitway corridors.

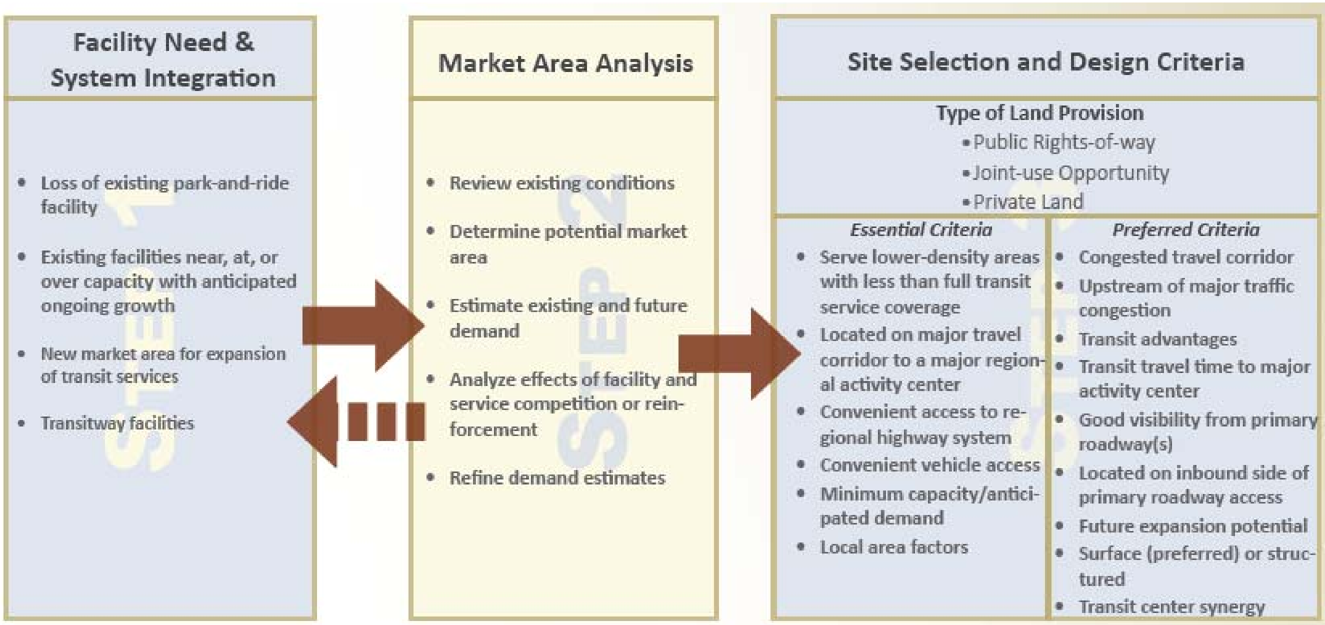
Figure 3-3 – Twin Cities Transit Market Areas



3.2.3.2. 2030 Park-and-Ride Plan - Chapter 5 Site Location Criteria

The *2030 Park-and-Ride Plan* supplements the transit passenger facilities discussion in Chapter 7 of the TPP by providing a more detailed guide to selecting, prioritizing, and implementing park-and-ride facilities. Guidance in Chapter 5 of the *2030 Park-and-Ride Plan* is especially important for transitways that include park-and-ride facilities as market draws to stations. Chapter 5 identifies the three major phases in park-and-ride planning as illustrated in Figure 3-4. See the *2030 Park-and-Ride Plan* for a more detailed discussion of each phase.

Figure 3-4 – Facility Planning Phases (2030 Park-and-Ride Plan Figure 5-1)



3.3. EXISTING CONDITIONS

3.3.1. Existing Conditions in the Region

The follow section summarizes the existing conditions of transitways and transitway modes in the Twin Cities region as related to the Station Spacing and Siting Guidelines.

3.3.1.1. Transit Travel Time Competitiveness (2008)

The TPP defines transitways as providing fast, reliable travel times and Appendix G provides guidance on travel time competitiveness for local and express bus[1]. This general policy direction is supported by results from the 2008 Metro Transit Rider and 2009 Potential Rider surveys, which reflect the high value customers put on transit travel time competitiveness and schedule reliability. Figure 3-5 and Figure 3-6 illustrate the transit travel time in 2008 to the CBDs of Minneapolis and St. Paul within the seven-county metro area (transfers between transit routes may be required to complete a trip). The maps indicate the varying degrees of transit travel time competitiveness in the region and are a resource against which anticipated transitway travel times can be compared.

(1) Page G-6 states local bus travel time should generally not exceed 2.0 times average auto time and express bus travel time should generally not exceed 1.35 times average auto time.

Figure 3-5 – Transit Travel Time and Distance to Minneapolis Central Business District

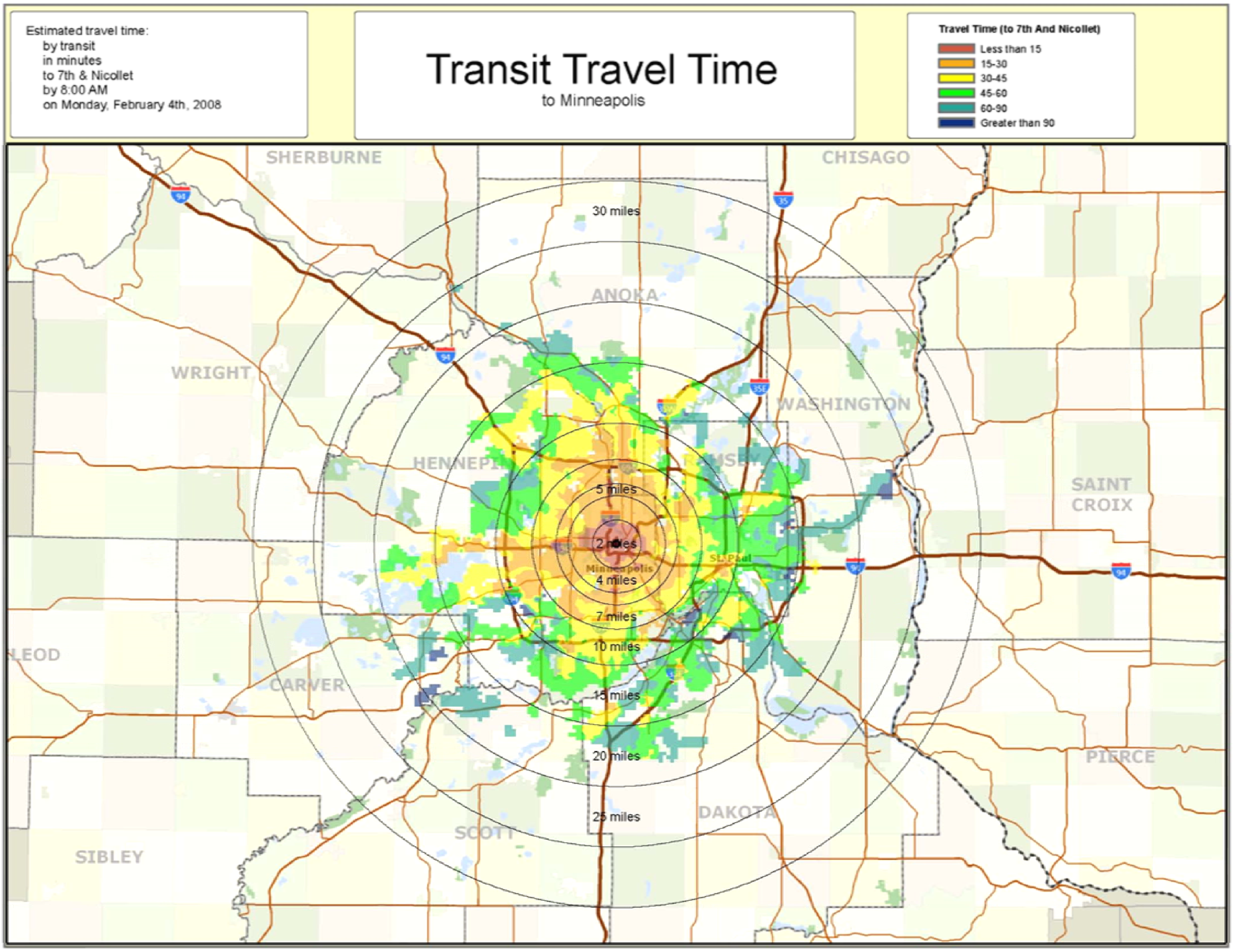
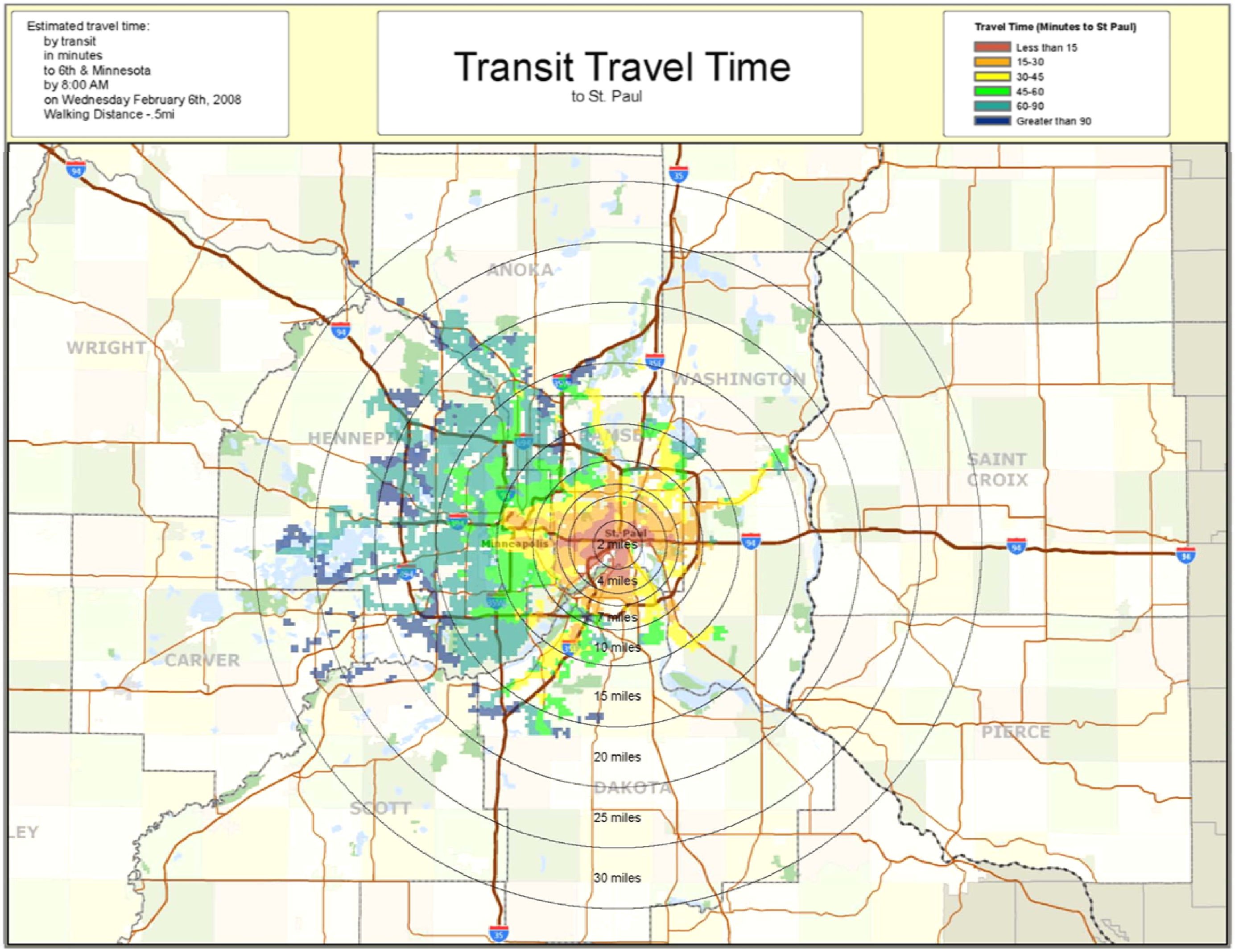


Figure 3-6 – Transit Travel Time and Distance to St. Paul Central Business District



3.3.1.2. Light-Rail Transit (LRT): Hiawatha and Central Corridor

There are currently two LRT lines in the Twin Cities region: the Hiawatha LRT, which began revenue operations in 2004, and the Central Corridor LRT, which is currently under construction and scheduled to open in 2014. Table 3-1 and Table 3-2 summarize information for existing station spacing conditions for the Hiawatha and Central Corridor LRT lines. The Hiawatha LRT has an average station spacing of 0.7 miles with an average of 1,427 boardings per station per weekday. The corridor includes population densities ranging from no population within ½-mile of the airport to two people per acre near the Mall of America to 34 people per acre near the Cedar-Riverside station. Employment densities range from less than one job per acre within ½-mile of the Cedar-Riverside and 50th Street/Minnehaha Park stations to more than 50 jobs per acre near the airport. Together with levels of auto ownership, Figure 3-7 illustrates the market area indices based on the areas within ½ mile of the stations range from four to one. While transportation markets at the airport, Fort Snelling and 28th Avenue do not appear strong based on the market area indices for the surrounding 1/2-mile area, these stations serve special functions and draw from larger than typical markets as shown by the average weekday boardings and generate ridership similar to land development patterns found in market area 2. The Central Corridor LRT, when complete, will have an average station spacing of 0.5 miles with an average of 1,780 boardings per station per weekday projected for 2030.

Figure 3-7 – Hiawatha Station Transit Market Area Index Scores

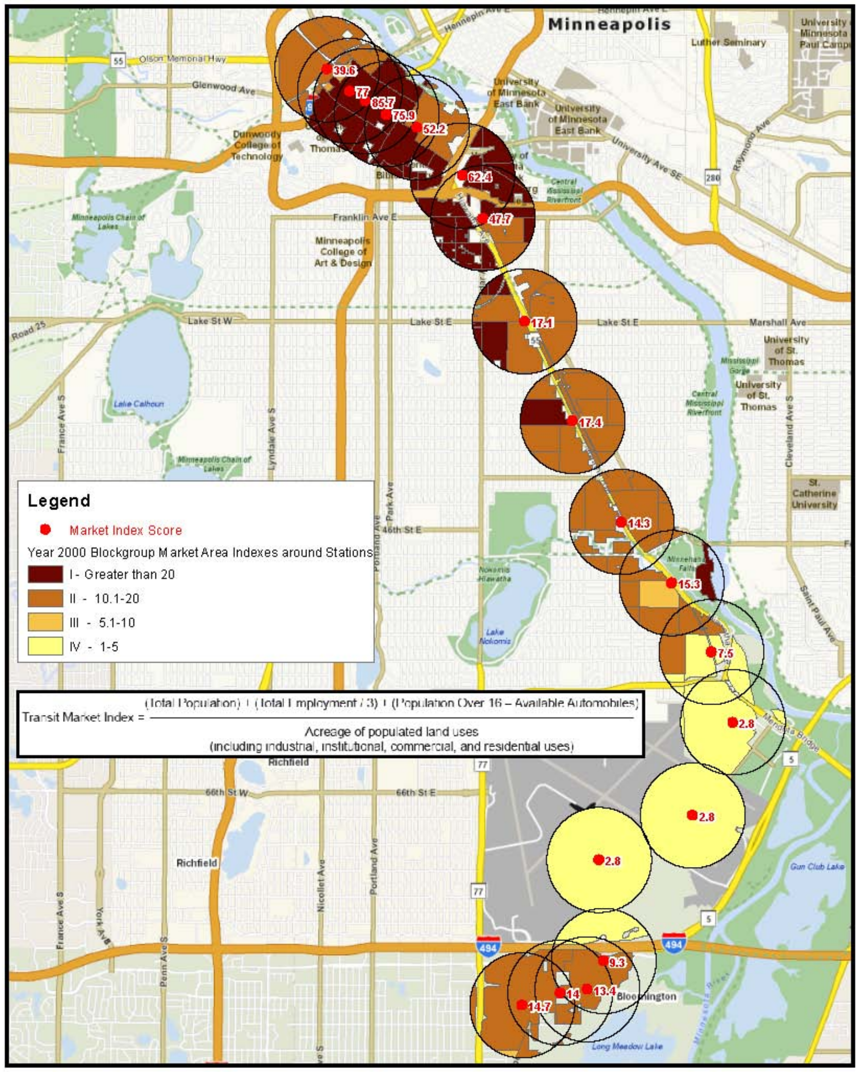


Table 3-1 – Hiawatha LRT Existing Station Spacing Conditions

Station	1st Q 2010 Avg Wkdy Boardings	Miles Between Stations	Minutes Between Stations	Speed (MPH) Between Stations
Non-CBD Stops				
Mall of America	1,939	-	-	-
28th Avenue	1,230	0.7	4.0	11
Bloomington-Central*	208	0.3	2.0	8
34th-American Blvd*	116	0.4	2.0	11
Humphrey Terminal	1,757	1.0	2.0	30
Lindbergh Terminal	2,746	1.2	2.0	36
Fort Snelling	1,239	1.0	2.0	30
VA Medical Center	827	0.7	2.0	22
50th Street	529	0.8	2.0	23
46th Street	1,526	0.8	2.0	23
38th Street	1,386	1.0	2.0	30
Lake Street	2,188	1.0	2.0	30
Franklin Avenue	1,314	1.0	3.0	20
Cedar Avenue	798	0.5	2.0	15
Total	17,803	10.4	29.0	-
Average	1,272	0.8	2.2	22
Minneapolis CBD Stops				
Downtown East - Metrodome	1,648	0.7	2.0	21
Government Plaza	1,805	0.3	2.0	10
Nicollet Mall	3,320	0.2	2.0	6
Warehouse District	1,840	0.2	2.0	6
Target Field*	692	0.3	3.0	6
Total	9,305	1.7	11.0	-
Average	1,861	0.3	2.2	10
Route Totals				
TOTAL	**27,108**	**12.1**	**40.0**	**-**
AVERAGE	**1,427**	**0.7**	**2.2**	**19**

*Stations added after start of operations.

Table 3-2 – Central Corridor LRT Planned Station Spacing Conditions

Station	2030 Forecast Boardings*	Miles Between Stations	Minutes Between Stations	Speed (MPH) Between Stations
Minneapolis CBD Stops				
Target Field	400	-	-	-
Warehouse District	3,650	0.3	3.0	9
Nicollet Mall	6,960	0.2	2.0	6
Government Plaza	1,960	0.2	2.0	6
Downtown East - Metrodome	3,010	0.3	2.0	9
Total	15,980	1.0	9.0	-
Average	3,196	0.3	2.3	8
Non-CBD Stops				
West Bank	1,170	0.7	2.0	21
East Bank	6,660	0.7	2.0	21
Stadium Village	950	0.5	2.0	15
29th Avenue	940	0.5	2.0	15
Westgate	1,140	0.5	2.0	15
Raymond Avenue	1,250	0.7	2.0	20
Fairview Avenue	1,880	0.9	2.0	27
Snelling Avenue	2,540	0.5	2.0	15
Hamline Avenue	600	0.5	1.5	20
Lexington Parkway	570	0.5	1.5	20
Victoria Street	400	0.5	1.5	20
Dale Street	550	0.5	1.5	20
Western Avenue	270	0.6	1.5	24
Rice Street	900	0.5	1.5	20
Total	19,820	8.1	25.0	-
Average	1,416	0.6	1.8	20
St. Paul CBD Stops				
Capitol East	340	0.4	2.0	12
10th Street	1,710	0.3	2.0	9
4th Street	1,130	0.4	2	12
St. Paul Union Depot	1,960	0.3	1	18
Total	5,140	1.4	7.0	-
Average	1,285	0.4	1.8	13
Route Totals				
TOTAL	**40,940**	**10.5**	**41.0**	**-**
AVERAGE	**1,780**	**0.5**	**1.9**	**15**

3.3.1.3. *Bus-Rapid Transit (BRT) and Limited Stop: I-35W South, Cedar Avenue, and limited stop routes*

Highway BRT

At the time of publication, the region does not have an operating Highway BRT line, but two are in planning and scheduled to begin operations in 2012. Cedar Avenue is planned to support Highway BRT station-to-Station service between 215th Street in Lakeville and the 28th Avenue LRT station in Bloomington. Highway BRT express service is planned to serve select stations in the corridor as noted in Table 3-3. I-35W South is planned to support Highway BRT station-to-station service between the Lakeville Kenrick Avenue Station and downtown Minneapolis as noted in Table 3-4. On Cedar Avenue, the average station spacing is planned to be 1.5 miles with a forecast average of 300 boardings per station in 2030 (year of opening forecasts are not available). On I-35W South, average station spacing is planned to be 2.8 miles (a forecast number of boardings per station is not available).

Table 3-3 – Cedar Avenue BRT Planned Station Spacing Conditions(1)(2)

Station Name(3)	2012 (2030) Forecast Boardings Stn-to-Stn*	2012 (2030) Forecast Boardings Express*	Miles Between Stations	Minutes Between Stations	Speed (MPH) Between Stations
28th Ave LRT(4)	125 (150)	-	-	-	-
MOA(4)	125 (150)	-	0.4	2.3	11
Cedar Grove	450 (250)	200 (250)	4.4	11.0	24
Cliff Road	(50)	-	1.6	4.5	21
140th St	250 (700)	- (1,800)	2.1	4.5	28
147th St	650 (600)	-	0.8	2.6	19
AVTS	450 (750)	1,700 (2,100)	0.7	2.4	17
161st St(5)	100 (50)	-	0.5	2.1	15
Glacier Way(5)	(50)	-	1.3	3.4	23
Lakeville Cedar	100 (200)	50 (300)	0.7	2.3	19
195th St	(550)	-	1.5	3.6	25
215th St	(50)	(25)	2.0	4.5	27
Total	2,250 (-1300)	1,950 (4,475)	16	43.2	-
Average	281 (296)	650 (895)	1.5	3.9	21

Notes:
(1) Source: Cedar Avenue Transitway Implementation Plan Update Draft Service Plan Technical Memorandum, Page A-1, June 2010.
(2) Boarding forecasts are estimates that assume a doubling of modeled morning station-area boardings. Forecasts for evening travel demand were not prepared.
(3) Shaded rows indicate stations planned for 2012 operations.
(4),(5) Station boarding forecasts in the original source were reported as one total for the two adjacent stations and have been evenly divided between the stations in this table for the purposes of this document.

Table 3-4 – I-35W South BRT Planned Station Spacing Conditions

Station Name(1)	2030 Forecast Boardings*	Miles Between Stations	Minutes Between Stations	Speed between Stations (MPH)
Leaving Downtown	Not Available	-	-	-
Lake Street	Not Available	1.8	3	35
46th Street	Not Available	2.0	3.1	39
66th Street	Not Available	3.4	5.1	40
82nd Street/American Blvd.	Not Available	2.0	2.6	45
98th Street	Not Available	2.2	3.2	41
Burnsville Transit Center	Not Available	4.4	8.8	30
South Burnsville	Not Available	2.9	6.4	27
Lakeville	Not Available	3.4	6.1	33
Total	Not Available	22.1	38.3	-
Average	Not Available	2.8	4.8	36

Notes:
(1) Shaded rows indicate stations planned for 2012 operations.

Arterial BRT

At the time of publication, the region does not have Arterial BRT lines operating. However, several existing, high-volume transit routes are identified as potential future Arterial BRT routes in the TPP (adopted January 2009).

3.3.1.4. Commuter Services: Express Bus and Northstar

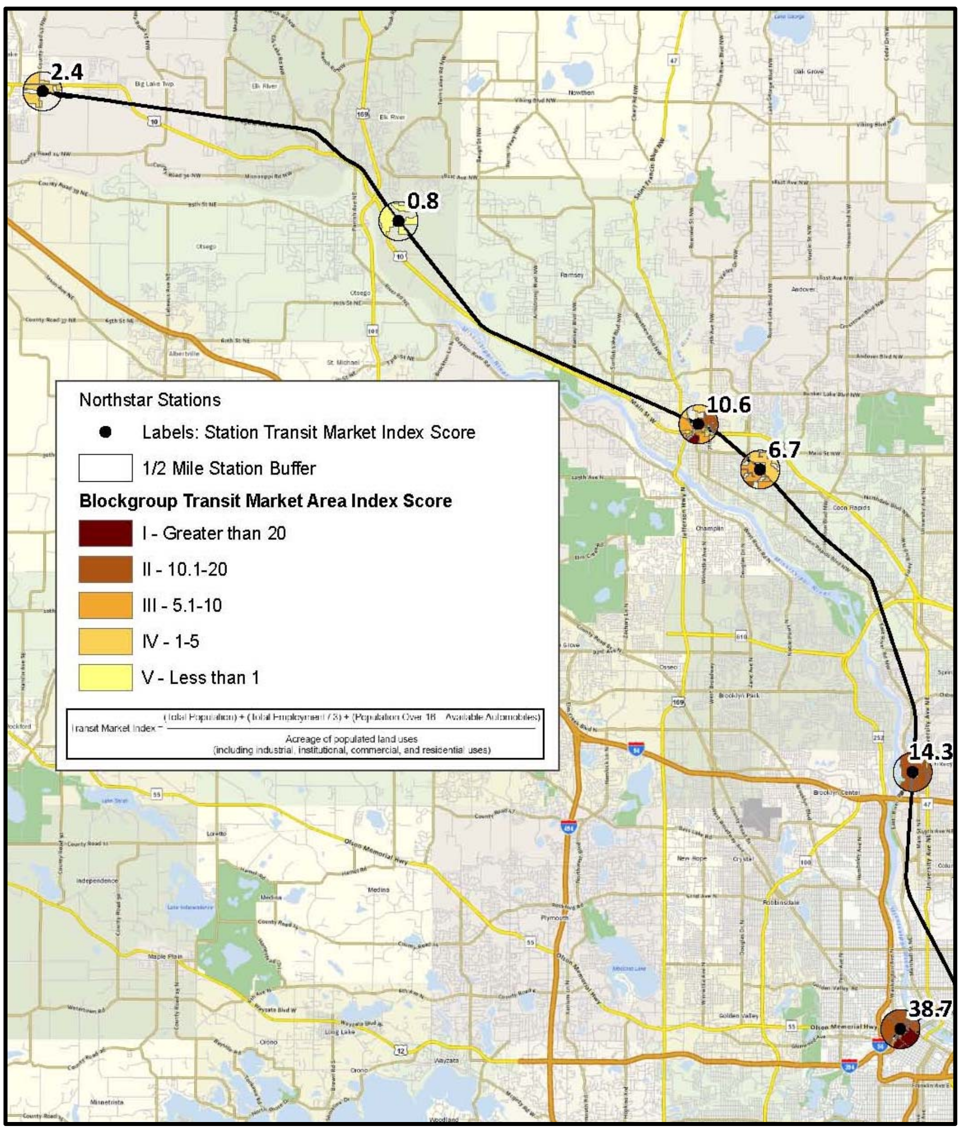
Transit provided during peak periods only in the region includes express bus and Commuter Rail. Express bus is extensive throughout the region. There is currently one Commuter Rail line in the Twin Cities region. The Northstar Rail began revenue operations in 2009.

Table 3-5 summarizes information regarding the existing station spacing conditions for the Northstar Rail. The Northstar Rail has an average station spacing of 7.8 miles with daily station boardings ranging from 71 in Fridley to 914 at Target Field in downtown Minneapolis (May 2010). The station closest to Minneapolis (the Fridley station) is 9.2 miles from the CBD. The corridor includes population densities ranging from less than one person per acre near the Elk River station to seven people per acre near the Anoka station. Employment densities range from less than one job per acre near the Elk River station to nearly 90 jobs per acre near Target Field. Together with levels of auto ownership, Figure 3-8 illustrates the specific market area indices for the station areas range from four to one.

Table 3-5 – Northstar Commuter Rail

Station	May 2010 Avg Wkday Boardings	Miles Between Stations	Minutes Between Stations	Speed (MPH) Between Stations	Distance to CBD (Mpls)
Big Lake	248	-	-	-	39
Elk River	310	10.3	10.0	62	28.7
Anoka	205	9.6	9.0	64	19.1
Coon Rapids	201	1.9	4.0	29	17.2
Fridley	71	9.2	8.0	69	8
Target Field	914	8.0	15.0	32	-
TOTAL	**1,949**	**39.0**	**46.0**	**-**	**-**
AVERAGE	**325**	**7.8**	**9.2**	**51**	**-**

Figure 3-8 - Northstar Station Transit Market Index Scores



3.3.2. Existing Conditions in Other Regions

The following section summarizes the existing conditions of transitways and transitway modes, as related to the Station Spacing and Siting Guidelines, in the regions other than the Twin Cities.

3.3.2.1. Light-Rail Transit (LRT)

Table 3-6 presents a summary of the station spacing on select LRT systems across the nation. The systems were identified and chosen based on relevance to the Twin Cities region. The select lines indicate an average spacing ranging from 0.7 miles on the Salt Lake City TRAX to 1.6 miles on the Seattle Central Link.

Table 3-6 – LRT Station Spacing in Other Regions

LRT Line	Miles between Stations			Minutes between stations			Ave Speed (MPH) between stations
	Longest	Shortest	Average	Longest (min)	Shortest (min)	Average (min)	
Salt Lake City, UT - TRAX	1.4	0.2	0.7	7	1	3	15
Seattle, WA - Central Link	5.7	0.4	1.6	9	2	4	25
Denver, CO - H-line	2.7	0.4	1.3	4	2	3	28
Los Angeles, CA - Metro Red Line	3.4	0.4	1.1	4	1	2	29
Minneapolis, MN - Hiawatha	*1.2*	*0.2*	*0.7*	*4*	*2*	*2.2*	*19*

3.3.2.2. Bus-Rapid Transit (BRT)

Table 3-7 presents a summary of the station spacing on select BRT systems across the nation and internationally. They were identified and chosen based on relevance to the Twin Cities region. The BRT systems represent a range of types BRT service with the average station spacing ranging from 0.2 miles on the Cleveland HealthLine to 1.1 miles on the Los Angeles Orange Line.

Table 3-7 – BRT Station Spacing in Other Regions

	Miles Between Stations		
BRT System	**Shortest**	**Longest**	**Average**
Cleveland – Health Line	0.13	0.5	0.2
Boston – Silver Line	0.1	1.9	0.32
Eugene – Emx	0.24	0.98	0.42
Las Vegas – MAX	0.25	1	0.5
Los Angeles – Metro Rapid	0.25	1	0.7
York Region – Viva	0.16	3.07	0.93
Pittsburgh	0.51	1.7	0.97
Los Angeles – Orange Line	0.54	2.2	1.1
Twin Cities - Cedar Avenue	*0.4*	*4.4*	*1.5*
Twin Cities – I-35W South	*1.8*	*4.4*	*2.8*

Source for information on lines outside the region: DRAFT Recommended Practices for BRT Service Design, American Public Transit Association, 2008.

3.3.2.3. Commuter Rail

Table 3-8 presents a summary of the station spacing on select Commuter Rail lines across the nation. They were identified and chosen based on relevance to the Twin Cities region and to illustrate the range of operations and performance. The select lines represented below (excluding the Caltrain and Metra systems) indicate average station spacing for Commuter Rail ranging from 3.78 miles on the TRE line to 9.0 miles on the ACE line.

Table 3-8 – Commuter Rail Average Station Spacing in Other Regions

	One-way track miles	Weekday train trips	Stations	Ave Spacing	2007/8 wkdy ridership
Sounder - WA	74	18	9	8.22	9,300
TRE - TX	34	49	9	3.78	9,300
Tri-Rail - FL	72	50	18	4.00	14,000
Rail Runner - NM	55	21	7	7.86	2,300
ACE - CA	90	8	10	9.00	3,000
Caltrain - CA	77	98	32	2.41	36,993
Front Runner - UT	38	73	7	5.43	4,100
Coaster - CA	41	22	8	5.13	6,800
Northstar - MN (2010)	***40***	***12***	***6***	***6.67***	***3,400***
Metra - IL	565	743	239	2.36	317,400

3.4. STATION SPACING AND SITING GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, and the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit Senior Staff the following Station Spacing and Siting Guidelines are recommended for adoption. The guidelines are summarized in Table 3-9. Table 3-9 also includes benchmark information for local transit service and express bus as provided in Appendix G of the TPP. These guidelines should be considered collectively when planning and designing transitway station locations. The guidelines are summarized and discussed below.

3.4.1. Primary Station Market Analysis Factors and Methods

The identification of transitway station areas should be based on travel demand demonstrated through rigorous market analysis of existing and planned future conditions, with primary emphasis on existing conditions.

The following are primary market analysis factors to be considered in the identification of station areas on transitways and Table 3-9 identifies the appropriate factors for each transitway mode:

- *Major travel patterns (including location of major activity centers)*
- *Population and employment density*
- *Auto ownership*
- *Trip purpose (e.g., commuters, students, shoppers, other)*
- *Existing transit ridership*
- *Commuter market analysis (geographic market area, existing and future demand, and facility and service competition or reinforcement)*

Station-area market analysis is a critical element of transitway planning and implementation. Proper analysis ensures the region will make wise investments by choosing station locations that provide high levels of transit service to key transit markets with high travel demand. This guideline is based on experience within the region.

The regional travel demand forecasting model, maintained by the Metropolitan Council, is the preferred method for developing transitway travel demand forecasts, including the performance of market analysis (see Chapter 11). If a transitway station's ridership demand is primarily dependent on a park-and-ride customer market, the transitway's station market analysis should also include the commuter market analysis.

3.4.2. Transportation Site Location Factors

Transitway stations should be sited to maximize convenience and minimize travel times for transitway passengers and vehicles under existing and planned future conditions, with primary emphasis on existing conditions.

The following are factors to be considered in the identification of station site location on transitways and Table 3-9 identifies the primary and secondary factors for each transitway mode:

- *Access to the station*
- *Impacts on the existing road and bicycle/pedestrian network*
- *Park-and-ride lot need*
- *Railroad trackway operational impact*

Siting an individual transitway station is of paramount importance. If a station is poorly sited, it will not generate high travel demand, even if market analysis forecasts high demand levels.

The guidelines identify four key transportation-related site location factors: access to the station for transit vehicles and customers, impacts on existing road network, inclusion in the Park-and-Ride Plan, and railroad trackway operational impacts. These factors are identified as primary or secondary factors for each mode in Table 3-9. In addition to considering these factors, the lead agency is responsible for coordinating with all affected transportation authorities, as identified in the Project Development, Leadership, and Oversight Guidelines. This guideline is based on experience within the region.

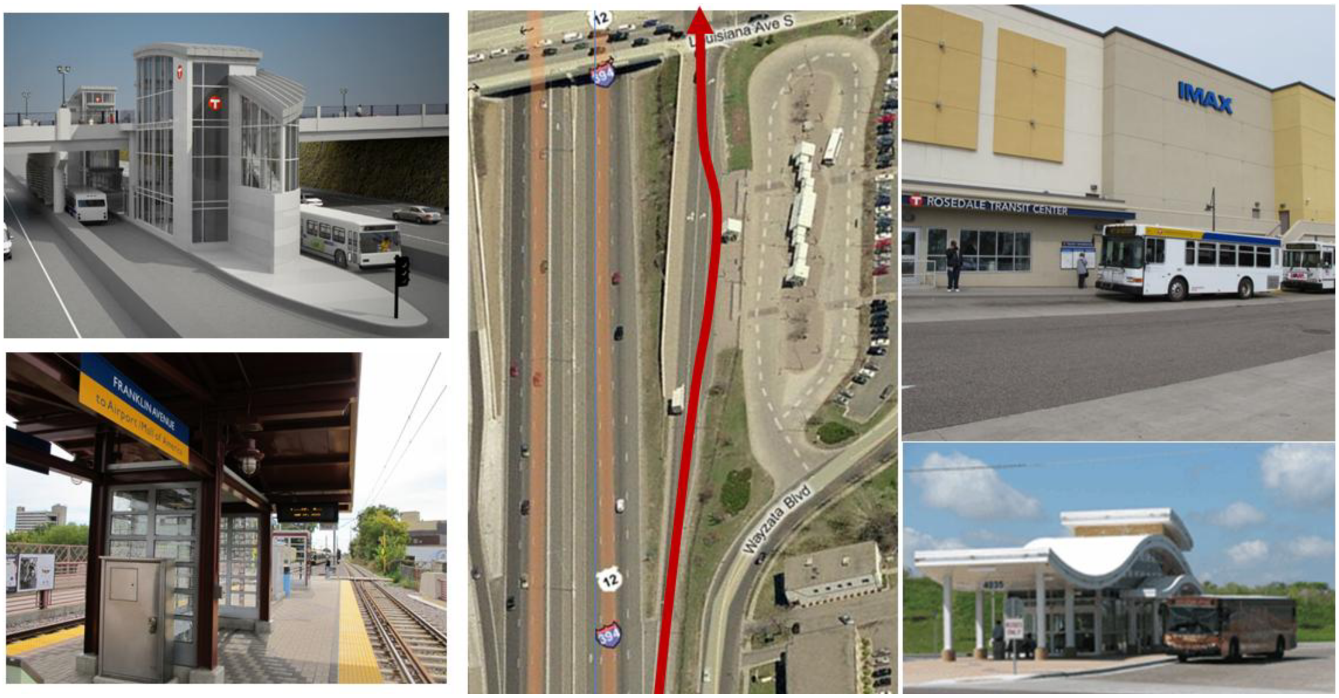
Access to the Station

For all transitway modes, access to the station for transit vehicles and customers is a primary factor in siting an individual station. It is critical to ensure that transit vehicles, including those specific to the mode and those connecting for transfers, and transit customers have safe and convenient access to the station. Convenient access will ensure efficient transit operations for all modes, and is critical in providing fast, reliable service on the transitway. Types of access that should be considered when siting a station and selecting the station type include transitway, connecting roadways that support transit transfers or customer access, sidewalks, and trails. Some types of access are considered primary for one mode and secondary for another depending on the market the transitway is intended to serve. See Table 3-1 for details.

Types of stations include online, inline, and offline and are illustrated in Figure 3-1. Referring to bus operations on transitways, online or inline stations are preferred for highway and Arterial Bus-Rapid Transit (BRT). Hybrid inline-offline stations should be implemented for Highway BRT service where online stations are not feasible, with the inline configuration provided for the inbound direction of travel. For all modes, end of line stations may be offline.

Figure 3-9 – Transitway Station Types

Online **Inline** **Offline**



Impacts on the Existing Road and Bicycle/Pedestrian Network

The siting of transitway stations should include analysis of traffic impacts on the existing road and bicycle/pedestrian network to understand the ease of access and safety of transit customers. Results should include level of service, average delay per vehicle, and crash information for key roadways and intersections (including bicycle/pedestrian crossings) used by the transitway vehicle and customers.

Park-and-Ride Lot Need

Highway BRT Express and Commuter Rail customers, and to a lesser extent Highway BRT station-to-station and light-rail transit (LRT) customers, typically access stations using park-and-ride lots. Local transfer connections are often fewer at Highway BRT express or Commuter Rail stations, with the customer base instead driving a personal vehicle to access the transitway. Personal vehicles need to be accommodated at stations to encourage transitway ridership, which is usually done through a park-and-ride lot where the customer parks his/her personal vehicle and rides transit to their destination.

The park-and-ride demand for a station should be analyzed. According to the Project Development, Leadership, and Oversight Guideline on Transitway Travel Demand Forecasting, the Regional Travel Demand Forecast Model is the preferred method for developing transitway travel demand forecasts. But use of rule-based modeling tools like the methodology outlined in Section 5.3 of the Park-and-Ride Plan may be appropriate, especially for estimating park-and-ride demand at Highway BRT express or Commuter Rail stations. Use of a rule-based method for estimating park-and-ride demand should be thought through carefully and justified in consultation with Metropolitan Council travel demand forecasting staff, and the reasons for using a rule-based method should be documented.

Railroad Trackway Operational Impacts

For LRT and Commuter Rail specifically, it is important to consider trackway operational impacts at proposed stations. Potential railroad trackway operational considerations at stations include the number of tracks available and their ability to provide access to station platforms, the presence or absence of track signal sightlines, the location of adjacent roadway crossings, and the location of adjacent track crossovers as needed to manage two-way train operations, including freight traffic sharing railroad track use with Commuter Rail, among others.

3.4.3. Land Use Site Location Factors

Transitway stations should be sited to fit with and enhance the neighborhoods surrounding them today and in the future, with primary emphasis on existing conditions.

Land use also significantly contributes to the success of station siting and generating high travel demand. Existing and planned land uses should be considered when siting a station with primary emphasis on existing uses. Land use factors include, but are not limited to, the following:

- *Land availability*
- *Land type and costs (e.g., public right-of-way, joint-use, private, etc.)*
- *Mix of land uses and compatibility with transportation functions*
- *Development plans including comprehensive and station-area plans*
- *Available infrastructure and the cost of providing additional infrastructure including bicycle and pedestrian infrastructure (e.g., sidewalks, bicycle-pedestrian overpass/underpass, etc.)*
- *Proximity to affordable housing*
- *Size of transit-dependent population*

In addition to considering these factors, the lead agency is responsible for coordinating with all affected land use authorities, per Project Development, Leadership, and Oversight Guidelines. This guideline is based on experience within the region.

3.4.4. Minimum Daily Boardings for Transitway Opening Year Forecast

Travel demand at each station should be substantial in the transitway's projected year of opening to justify the need for access to the transitway and the resulting travel-time delay. The recommended minimum daily boardings for each mode are identified in Table 3-9.

Stations provide the important function of giving travelers access to and from a transitway. But at the same time, travel time is lengthened and operations cost increased due to the slowing, stopping, and restarting required for a transit vehicle to serve a station. Because both travel speed and access are foundational characteristics of transitways, the guidelines seek to strike a balance that supports both.

The guidelines recommend minimum daily boardings per station in the forecast year of transitway opening that range from 50 or more for Arterial BRT to 300 or more for LRT. The guidelines include a minimum of 200 for Highway BRT express and Commuter Rail, which is consistent with current requirements for an express bus stop as stated in Chapter 5 of the Park and Ride Plan.

Highway BRT stations may serve more than one transitway mode, including station-to-station and express BRT. If service for modes are planned to be implemented at the same time serving the same station, the minimum daily boardings for the opening year forecast should be the total for the two modes (e.g., Highway BRT station-to-station minimum is 100 or more, Highway BRT express is 200, minimum for a station serving both modes with both modes opening at the same time would be 300 or more boardings).

3.4.5. Average Station Spacing for the Line (Outside the Minneapolis/St. Paul Central Business Districts)

Transitway access should be balanced over the length of a line to ensure the line delivers the speed and travel-time reliability that drives the line's market competitiveness. The average station spacing for each mode is identified in Table 3-9.

The length of the line is defined by the service operating plan anticipated for the transitway in the year of opening; the length of the line and station spacing to be averaged should include all through-routed services outside the Minneapolis and St. Paul CBDs. This guideline is based on consideration of station spacing in this region and in other regions and acknowledgment of the effect the number of stations has on transitway travel-time competitiveness. This guideline seeks to support balanced levels of access and mobility on transitways.

3.4.6. Minimum Spacing between Two Stations (Outside the Minneapolis/St. Paul Central Business Districts)

Transitway access should be balanced within a line to ensure each line is accessible to key transitway markets and delivers the speed and reliability that drives the line's market competitiveness. The minimum station spacing for each mode is identified in Table 3-9.

The recommended guidelines do not address station spacing within CBDs where station design is project specific and based on street network capacity and land use. This guideline allows closer station spacing to provide more frequent transitway access where demand warrants and is balanced with average station spacing for the overall transitway to support balanced levels of access and mobility on transitways.

3.4.7. Minimum Distance between Minneapolis/St. Paul Central Business Districts and Next Station

Highway BRT and Commuter Rail stations should be sited to complement the transit system already serving the Minneapolis and St. Paul central business districts. The minimum distance between Minneapolis/St. Paul CBD and next station for each mode are identified in Table 3-9.

Three modes are intended to primarily serve markets with trip origins located outside the Minneapolis and St. Paul CBDs. These are Highway BRT station-to-station, Highway BRT express, and Commuter Rail. To support this market focus and minimize ineffective competition with other transit services, transitway stations should be located between one (Highway BRT station-to-station) and seven miles or more (Commuter Rail) from the Minneapolis or St. Paul CBDs. This guideline is based on consideration of station spacing in the region, acknowledgment of the effect the number of stations has on transitway travel-time competitiveness, and acknowledgement that the existing transit system generally provides competitive travel times within five miles of the Minneapolis and St. Paul CBDs (15- to 30-minute travel times). This guideline seeks to support balanced levels of access and mobility on transitways.

3.4.8. Staged Development of Stations

Some stations should be planned for but built after initial construction of the larger transitway.

To be included in initial planning/alternatives analysis, a station should be supported by land use densities that are included in the city's comprehensive plan as evidenced by the station's forecast travel demand meeting the minimum ridership threshold for the planning horizon year.

To be included in the Draft Environmental Impact Statement (DEIS)/preliminary/final design, a station should be included in an approved station-area master plan, which should be adopted as part of the city's comprehensive plan and zoning ordinance, and the station's forecast travel demand should meet the minimum daily boardings threshold for the planning horizon year. The DEIS should distinguish between those stations that are expected to meet ridership thresholds by opening year and those expected to meet ridership thresholds by the planning horizon year. The latter should be identified as potential future stations.

To be included in construction, there should be:

- *Progress toward realizing the planned land development for the station area as evidenced by activities such as land assembly, developer interest, development agreements, and/or construction of municipal infrastructure;*
- *Evidence that enough development will be in place within five years of opening to achieve the minimum daily boardings threshold at the station; and*
- *Evidence that cost savings are significant when the station is constructed concurrently with the runningway.*

A station may also be included in construction when there is a significant low-income and/or transit-dependent population within ½ mile of the station and a master station-area plan has been approved (i.e., adopted as part of the city's comprehensive plan and zoning ordinance) even though development has not yet occurred.

Stations included in the final design may be added as infill stations after construction of the line when the above conditions for construction are met without meeting the evaluation criteria in Table 3-9. Proposed infill stations that are not included in the final design will be evaluated based on the evaluation criteria shown in Table 3-9.

Transitway stations should be built when travel demand is proven imminent as a way to protect mobility and the significant investment required to implement transitways while ensuring appropriate access is also provided. This guideline seeks to ensure that stations can be planned for but constructed later in cases where a transitway is built before planned land uses are developed to levels that justify station construction.

3.4.9. Addition of New Stations

Justification for stations not included in the final design for a transitway should consider the guidelines above, as well as others, to protect the line's balance between access and mobility and the substantial investment required to implement transitways. Other considerations may vary based on the transitway, but should include the following:

- *Inter-station competition on the transitway*
- *Market-area overlap with other transitways including express bus*
- *Impacts on transitway travel time and service reliability*
- *Capital and operating costs*

Table 3-10 presents an example of the additional analysis done for a Commuter Rail station; relevant analysis factors may vary by station and transitway mode.

Table 3-9 – Station Spacing and Siting Guidelines Summary

The primary objective of service operations on a transitway is to be fast and reliable. There are two types of transitways: frequent service operates bi-directionally all day; commuter express service primarily operates in the peak travel direction during peak periods. Transitways have four dimensions of convenience (speed, reliability, availability/frequency and access) that each play an important role in how a transitway functions. Differences in speed and access between transitway modes are the result of the service and network design and strongly impact service operations. Speed is determined by transit advantages such as runningway and technology, fare collection and station spacing. Access is also defined by station spacing. Various transitway modes trade-off varying levels of speed, frequency, and access, but the reliability of a transitway is a constant that cannot be compromised. Speed, frequency, and access need to be coordinated or balanced within the "family of services" in a corridor.

	Local Service (Benchmark)	All-Day Frequent Service			Express Service (Benchmark)	Commuter Express Service	
	Local Bus/Limited Stop	Arterial Bus-Rapid Transit (BRT)	Highway Bus-Rapid Transit (BRT) Station-to-Station	Light-Rail Transit (LRT)	Express Bus	Highway Bus-Rapid Transit (BRT) Express	Commuter Rail
3.4.1. Primary Station Market Analysis Factors and Methods	Population and employment density	Major travel patterns (including location of major activity centers), population and employment density, auto ownership, and trip purpose (e.g., commuters, students, shoppers, other), existing transit ridership; regional travel demand forecast model or similar resource	Major travel patterns (including location of major activity centers), population and employment density, auto ownership, and trip purpose (e.g., commuters, students, shoppers, other), existing transit ridership; regional travel demand forecast model or similar resource for stations without a park-and-ride; Commuter Market Analysis: Park and Ride Plan Chapter 5 for park-and-ride-based stations	Major travel patterns (including location of major activity centers), population and employment density, auto ownership, and trip purpose (e.g., commuters, students, shoppers, other), existing transit ridership; regional travel demand forecast model or similar resource for stations without a park-and-ride; Commuter Market Analysis: Park and Ride Plan Chapter 5 for park-and-ride-based stations	Commuter Market Analysis: Park and Ride Plan Chapter 5	Commuter Market Analysis: Park and Ride Plan Chapter 5; or Regional Travel Demand Forecast Model if part of corridor wide analysis	Commuter Market Analysis: Park and Ride Plan Chapter 5; and/or Regional Travel Demand Forecast Model
3.4.2. Transportation Site Location Factors	Primary: Access to, and visibility of, stop for transit vehicle and customers via existing walk, trail, and transit transfer connections	Online or inline stations preferred. Primary: Access to, and visibility of, station/stop for transit vehicle and customers via existing walk, trail, and transit transfer connections	Online or inline stations preferred. Primary: Maximize operational speed, access, and visibility of station for transit vehicle on BRT runningway (online, inline or offline station) and customer access via existing walk, trail, and transit transfer connections, and existing highways Secondary: Park and Ride lot need based on commuter market analysis (e.g., Park and Ride Chapter 5)	Stations should be online. Primary: Access to, and visibility of ,station for customers via existing walk, trail, and transit transfer connections and impacts on existing road network Secondary: Park and Ride lot need based on commuter market analysis (e.g., Park and Ride Chapter 5)	Online or inline stations preferred. Primary: Park and Ride lot need based on commuter market analysis (e.g., Park and Ride Chapter 5); Access to and visibility of station for transit vehicle and customers via existing highways; presence of a major travel corridor serving a major regional activity center Secondary: Access to station for customers via existing walk, trail, and transit transfer connections	Online or inline stations preferred. Primary: Park and Ride lot need based on commuter market analysis (e.g., Park and Ride Chapter 5); Access to and visibility of station for transit vehicle via BRT runningway (on-line vs. off-line station) and customers via existing highways Secondary: Access to station for customers via existing walk, trail, and transit transfer connections	Stations should be online. Primary: Park and Ride lot need based on commuter market analysis (e.g., Park and Ride Chapter 5); Access to and visibility of station for customers via existing highways; Trackway operational impacts Secondary: Access to station for customers via existing walk and transit transfer connections
3.4.4. **Minimum** Daily Boardings for Transitway Opening Year Forecast	N/A	50 or more boardings per station	100 or more boardings per station	300 or more boardings per station	200 or more boardings per station	200 or more boardings per station	200 or more boardings per station
3.4.5. **Average Station Spacing for the Line** (outside Minneapolis/St. Paul Central Business Districts)	1/4 to 1/8 mile	1/4 mile to 1/2 mile	2 miles	1 mile	5 miles/market specific	5 miles/market specific	7 miles or longer
3.4.6. **Minimum** Spacing **between Two Stations** (Outside Minneapolis/St. Paul Central Business Districts)	1/8 mile or longer	1/8 mile or longer	1/2 mile or longer	1/2 mile or longer	4 miles or longer/market specific	4 miles or longer/market specific	5 miles or longer
3.4.7. **Minimum Distance** between Minneapolis/St. Paul Central Business Districts and Next Station	N/A	N/A	1 mile or longer	N/A	5 miles or longer/market specific	5 miles or longer/market specific	7 miles or longer/market competitiveness analysis

3.4.3. Land Use Site Location Factors

Land use factors should be considered when siting a station - primarily existing conditions, secondarily future plans. These include land availability, land type and costs (e.g., public right-of-way, joint-use, private, etc.), mix of land uses, development plans (including comprehensive plans, station-area plans), available infrastructure and the cost of providing additional infrastructure (including pedestrian infrastructure, e.g., pedestrian bridge), proximity to affordable housing, and size of transit-dependent population.

3.4.8. Staged Development of Stations

Some stations should be planned for but built after initial construction of the larger transitway.

To be included in initial **planning/alternatives analysis**, a station should be supported by land use densities that are included in the city's comprehensive plan as evidenced by the station's forecast travel demand meeting the minimum ridership threshold for the planning horizon year.

To be included in the **DEIS/preliminary/final design**, a station should be included in an approved station-area master plan, which should be adopted as part of the city's comprehensive plan and zoning ordinance, and the station's forecast travel demand should meet the minimum daily boardings threshold for the planning horizon year. The DEIS should distinguish between those stations that are expected to meet ridership thresholds by opening year and those expected to meet ridership thresholds by the planning horizon year. The later should be identified as potential future stations.

To be included in **construction**, there should be:

- Progress toward realizing the planned land development for the station area as evidenced by activities such as land assembly, developer interest, development agreements, and/or construction of municipal infrastructure;
- Evidence that enough development will be in place within five years of opening to achieve the minimum daily boardings threshold at the station; and
- Evidence that cost savings are significant when the station is constructed concurrently with the runningway.

A station may also be included in **construction** when there is a significant low income and/or transit dependent population within 1/2 mile of the station and a master station-area plan has been approved (i.e., should be adopted as part of the city's comprehensive plan and zoning ordinance) even though development has not yet occurred.

Stations included in the final design may be added as infill stations after construction of the line when the above conditions for construction are met without meeting the evaluation criteria in Table 3-9. Proposed infill stations that are not included in the final design will be evaluated based on the evaluation criteria shown in Table 3-9.

3.4.9. Addition of Stations

Transitway stations proposed after transitway plan approval or operation must consider the guidelines provided above, as well as others including inter-station competition, market-area overlap with other transitways including express bus, travel time and service reliability impacts, and capital and operating costs. See attached example.

Transit Market Analysis (per Project Development, Leadership, and Oversight Guidelines)

Several market area analysis methods can be used in transitway project development, foremost is the regional travel demand forecast model and then the analysis method outlined in the 2030 Park and Ride Plan Chapter 5. Key factors to identify and evaluate include existing conditions, potential market area, existing and initial estimates of future demand, effects of facility and service competition or reinforcement, and final demand estimates.

Table 3-10 – Example Infill Station Impact Analysis

"Infill" Commuter Rail Station Screening Criteria	
Service Reliability	Pass/Fail: delay impact of platform design/access, signal placement or track alignment required
New Market attractiveness	-1 pt/minute schedule delay impacting new market attractiveness
New rail customers	+10% = 5 pts percentage growth of overall ridership
Existing customer impact	each 10% of existing customers= -1 pts/3 min trip add
Service Consolidation	1pt/10% of existing transit service replaced: adjacent transit options: travel time, location & fare
Other criteria TBD	
Scoring	0+ Pass
	-1 or lower Fail
Cost and Funding Considerations	
Frequency/Capacity/Span of Service	Yes/No: service level to meet demand
Regional Operating Cost	service cost to meet demand (crews and maintenance)
Capital Cost	construction and easements
Regional Funding Opportunity Cost	other projects advancement impacted

4. STATIONS AND SUPPORT FACILITIES

4.1. INTRODUCTION

4.1.1. Chapter Introduction

This document provides the technical basis and rationale for the Regional Transitway Guidelines recommended for stations and support facilities through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff.

Following the introduction, the remainder of this document is organized into the following sections:

- Relevant background
- Station design
- Station engineering
- Station operations and maintenance
- Station safety, security, communications, and central control
- Station costs
- Transitway support facilities
- Local betterments
- Guidelines recommended through the technical development process

4.1.2. Committee Purpose

Transitway stations and support facilities should fit in with and enhance the neighborhoods surrounding them. Transitway stations and support facilities should be functional, attractive, cost-effective, and generally consistent by transitway mode across the region. Station and support facility designers should work to:

1) Achieve an attractive, informative environment for passengers at stations that is consistent with local community context, transitway identity, and passenger waiting times
2) Achieve functional integration with the surrounding land uses, which may include forming a nucleus for transit-oriented development at stations
3) Promote a safe and secure environment by designing all elements to enhance passive security by maintaining visibility to and within the station and station area
4) Implement an interdisciplinary approach to station and support facility design that incorporates advancements in technology
5) Achieve a functional, cost-effective outcome that balances aesthetics with available funding

Consistent with the approach stipulated in the *Central Corridor LRT Report for Design Criteria* (available from Metro Transit on request), a two-pronged design approach is recommended. Basic station elements such as system signs, maps, structural elements, materials, power systems, and others are recommended to have consistent, system-wide design. Other elements such as kiosks, pavement pattern, handrails, bike racks, benches, retaining walls, and others are variable to respond to site-specific conditions such as neighborhood context. Design considerations should include selecting materials for impact resistance, wear, strength, weathering qualities, and standardized to facilitate repair or replacement. Unique site conditions may require design adjustments. However, care should be taken to only incorporate changes that enhance operational efficiency and quality, to the benefit of transit patrons and operators.

Transitway planners and designers should be aware that local jurisdictions may have zoning and ordinance requirements, design guidance and/or local policies relevant to transitway stations and support facilities. Early coordination with cities will be essential in integrating transitway stations and support facilities with surrounding neighborhoods, streets, sidewalks, and bikeways.

4.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes are Arterial Bus-Rapid Transit (BRT), Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are designed to provide reliable and fast or frequent service to major activity centers.

The Station and Support Facilities Guidelines address stations and support facilities being built as part of LRT, Commuter Rail, and Highway and Arterial BRT projects. Guidelines for stations being built as part of Dedicated Busway or Express Bus with Transit Advantages projects, which are other transitway modes in the region’s long-range transportation plan but not discussed here, can be developed in the future.

4.2. BACKGROUND INFORMATION

4.2.1. Definitions

The following section defines terms applicable to the Stations and Support Facilities Guidelines.

4.2.1.1. Transitway Station Definitions

Stations are an integral component of fixed route transit lines such as LRT, Commuter Rail, and BRT transitways. A transitway station is a readily identifiable public place where scheduled vehicles stop during every trip. Transitway stations serve two primary purposes: they provide access to the transitway and provide transit information to patrons. Stations may serve more than one type of transit service. In addition to station-to-station service, for example, LRT, Commuter Rail, and BRT stations may also serve express and local bus service from multiple operators. It is key to the operation of the entire transit system that stations are easily understood, friendly, and efficient for both passengers and transit operators.

Because transitway stations generally serve higher daily passenger volumes as compared to local bus stops, transitway stations typically include greater investment in the physical infrastructure and amenities. Examples of amenities include lights, heaters, passenger seating, litter receptacles, restrooms, landscaping/streetscaping, and public art, as well as fare vending and validation machines.

Three categories of transitway stations are defined based on proximity to primary runningway.

<u>Online station</u> – Online stations are located within the vehicle runningway and the transitway vehicle can access them without leaving the runningway. Online stations are important elements of transitway service speed, reliability, and accessibility. Examples of online stations include all LRT and Commuter

Rail stations, the I-35W South station at 46th Street, and the Apple Valley Transit Station on Cedar Avenue.

Inline station – Inline stations are located adjacent to the vehicle runningway, typically along freeway interchange ramps. Although they require the transitway vehicle to exit the primary runningway, they provide a fast opportunity to access a station and immediately return to the runningway. Few or no turns are required. Examples include the I-35W South BRT stations at 66th Street and future stations at 82nd Street and 98th Street.

Offline station – Offline stations support transitway accessibility and ridership, but require transitway vehicles to exit the runningway and require several turning movements and potential traffic delays that impact transitway service speed and reliability, especially during peak travel times. Examples of current offline transitway stations are Cedar Grove Transit Station and Burnsville Transit Station.

A transitway station may be included in one or more of the categories. For example, the I-394 Louisiana Avenue station is an inline station for inbound trips, but offline for outbound trips.

4.2.1.2. Definitions for Facilities at Transitway Stations

In addition to providing transitway access and information facilities, a transitway station may also provide facilities supporting one or more of the following functions:

Transit center (informally referred to as a hub) – A transitway station may serve as a transit center, which is a place where two or more transit routes make scheduled connections. The center may or may not include transit layover facilities. Transit centers typically serve higher daily passenger volumes as compared to bus stops and have greater investment in the physical infrastructure and amenities. Examples of amenities include bicycle parking, amenities available at shelters (e.g., lights, heaters, passenger seating, security cameras, and customer information displays), as well as larger, more substantive, enclosed buildings.

Park-and-ride – A transitway station may include park-and-ride facilities, which provide for daytime (and sometimes limited overnight) parking for transit customers' automobiles and bicycles. A park-and-ride may or may not function as a transit center or include transit layover facilities.

Transit layover - A transitway station may serve as a location where transit vehicles, either bus or rail, lay over as they wait to enter service at that location. Bus layover facilities are paved areas, sometimes with separate circulation drives, sized to accommodate the required number of vehicles needed at any one time and their turning requirements. Rail layover facilities are areas of trackage separate from platform-access trackage where trains wait to enter service at that location. Rail layover facilities may be extensions of trackage at the end of terminal stations, or siding tracks adjacent to operating tracks within the transitway.

4.2.1.3. Definition of Transitway Support Facilities

Transitway support facilities include those providing daily vehicle storage and cleaning, major vehicle maintenance, central system control, and/or runningway maintenance. Other elements of transitway runningways, including power substations and traffic signals, are discussed in the Runningways Chapter.

4.2.2. Technical Conditions Establishing Need for a Station

The technical conditions establishing the need for a transitway station are discussed in Chapter 3: Station Spacing and Siting.

4.2.3. Existing Laws and Regulations

A number of national, state, and local regulations, standards, and practices presently address transit station design. These include but are not limited to those listed below. Local coordination is essential.

4.2.3.1. Laws and Regulations

- Americans with Disabilities Act (ADA)
- National Environmental Policy Act (NEPA)
- Federal Railroad Administration (FRA)/Federal Transit Administration (FTA) Joint Policy on Shared Corridors
- Title VI of the Civil Rights Act of 1964
- Minnesota Environmental Policy Act (MEPA)

4.2.3.2. National/State Design Standards

Design requirements for stations and support facilities should comply with current the State of Minnesota Uniform Building Code, and all laws, ordinances, rules, regulations, and lawful orders of any public entity bearing on the performance of the work. Resource documents in addition to the Minnesota State Building code include:

- *American Public Transportation Association (APTA) Guidelines for Design of Rapid Transit Facilities*
- Relevant American Railway Engineering and Maintenance of Way Association (AREMA) standards and recommended practices
- Relevant American Association of State Highway and Transportation Officials (AASHTO) standards and recommended practices
- Relevant National Fire Protection Association (NFPA) standards and recommended practices
- *Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways (MnMUTCD)*
- *Mn/DOT Road Design Manual*
- Mn/DOT State Aid guidance
- State of Minnesota Sustainable Building Guidelines

The Station and Support Facility Guidelines support the use of sustainable methods and materials. APTA defines sustainability as “practices that make good business sense and good environmental sense. It is balancing the economic, social and environmental needs of a community.” Relative to transit station design, this means:

“Employing practices in design and capital construction, such as sustainable building materials, recycled materials and solar or other renewable energy sources to make facilities as ‘green’ as possible.” (source: TriMet Design Criteria, rev. January 2010)

As the transit industry continues to advance in this area, the Metropolitan Council supports increased consideration of the long-term benefits of more sustainable techniques in evaluating cost-effective transit facility construction and maintenance. Current national, state, and local design standards, which form the basis for these guidelines, should be considered in this light.

4.2.3.3. Local Design Guidance

- *Central Corridor LRT Report for Design Criteria (CCLRT Design Criteria)* and subsequent updates (available from Metro Transit on request)
- *Northstar Corridor Rail Project Design Criteria (Northstar Design Criteria)* and subsequent updates (available from Metro Transit on request)
- Metro Transit LRT Fire Life Safety Code
- All local jurisdictional standards and requirements
- *2030 Transportation Policy Plan, Appendix G Transit Standards*
- *Metropolitan Council 2030 Park-and-ride Plan*

Local jurisdictions may also have zoning and ordinance requirements, design guidance and/or local policies relevant to integrating municipal facilities when transit runningways traverse or cross city streets, sidewalks, and bikeways. Current municipal guidance includes:

- *St. Paul Central Corridor Bicycle and Pedestrian Plan* (http://stpaul.gov/index.asp)
- *Access Minneapolis, Street and Sidewalk Design Guidelines* (http://www.ci.minneapolis.mn.us/publicworks/trans-plan/DesignGuidelines.asp)
- *Minneapolis Downtown Action Plan*
- *Minneapolis Pedestrian Master Plan*
- *Minneapolis Bicycle Master Plan and Bicycle Design Guidelines*

The section on transit facilities in the *Access Minneapolis, Design Guidelines for Streets and Sidewalks, Pedestrian Facility Design, October 26, 2009* provides s a good example of local guidance.

4.2.4. Property Acquisition and Remnant Parcel Reuse or Resale

Where it is determined that property should be acquired for a transitway station or support facilities, and that such acquisition is feasible and cost-effective, such acquisition should follow all applicable local, state, and federal regulations, including NEPA requirements for environmental clearance before property acquisition.

Where remnant parcels are indicated as unneeded, transfer of ownership should also follow local, state, and federal regulations and procedures. The owning entity should consult with local jurisdictions prior to initiating a transfer of ownership as local considerations for connections to the adjacent community and support for transit oriented development may affect the disposition of remnant parcels.

4.2.5. Context Sensitive Solutions and Transit Oriented Development

Station and support facility designs should be aesthetically pleasing and complement the character of their surroundings. Consistent with the new federal emphasis on valuing communities and neighborhoods, stations and support facilities should be designed to take advantage of attractive, existing site features, and be compatible with surrounding land uses and development patterns. Where consistent with land use policies, stations can form the nucleus for transit-oriented development (TOD) which strengthens both the surrounding area and opportunities for economic development. Refer to the Metropolitan Council's TOD and comprehensive planning guidelines for more discussion of land uses near transitways.

Coordination with and engagement of partner implementation and affected agencies, stakeholders, and the general public are critical responsibilities of the organization leading transitway planning and design, including stations and support facilities, as identified in the Project Development, Leadership, and Oversight Guideline 11.7.2 – Coordination of Agencies and Stakeholders.

4.2.6. Integration with Existing Systems

When new rail corridors and BRT services are added to the existing Twin Cities transit system, three guidelines should prevail:

- Station elements should be consistent with existing stations, updating with improvements where lessons learned from previous implementation indicates better results can be achieved in passenger information, efficient operation, life-cycle maintenance, and operational costs.
- Station area vehicle requirements should be consistent. Bus fleets from multiple operators should be able to access any bus drop off or layover facility within the regional network of transit stations. One corridor's light-rail vehicles (LRVs) must be able to use another regional LRT corridor's stations.
- Vehicles serving BRT corridors will be serviced and stored at bus garages serving non-BRT buses. Garage facilities may require modification to accommodate BRT vehicles, and operating procedures may require revision to ensure consistent and correct assignment of BRT vehicles.

Stations and support facilities should be upgraded with more sustainable elements as technology improvements in lighting, coatings, building materials, and construction techniques become cost-effective.

4.3. STATION DESIGN

Transitway stations fulfill two primary functions: they provide access to the transitway and transit information to customers. To fulfill these functions, transitway planners and designers should carefully consider the facilities to be provided at each station including facility sizing, amenities and transitway information included, and materials used. Planners and designers should ensure each station fits with and enhances the neighborhood surrounding it in terms of both function and aesthetics.

4.3.1. Station Facilities

One of the primary functions of transitway stations is the provision of facilities so that transit patrons can access the transitway. All transitway stations should provide facilities that support access for pedestrians and people using wheelchairs or bicycles, including providing bicycle parking, a transit passenger waiting area with weather shelter, and a transitway boarding area (i.e., platform. Stations should also provide areas for short-term pick-up/drop-off of transit patrons by shuttle, taxi, etc).

Stations may also include facilities for some or all of the following functions (see definitions in Section 4.2.1):

- Transit center
- Park-and-ride

- Transit layover

The major factors which determine the facilities to provide at each station are existing and future:

- Passenger demand
- Market needs
- Transit service plans (transitway and other transit services)
- Capital, operating, and maintenance costs
- Available right of way
- Consistency with surrounding development and land use policies

Stations generally fall into three location contexts: urban, suburban, and exurban. Urban stations, such as those within the cities of Minneapolis and St. Paul, experience heavy pedestrian, bicycle, and feeder bus demand. Park-and-ride facilities do not generally fit within Minneapolis or St. Paul policies or the *2030 Park-and-Ride Plan* and thus are discouraged. Suburban stations are generally located in areas where the development pattern is more widely dispersed, with more patrons arriving via auto. Park-and-ride facilities are generally recommended where space and local policy permits. Stations in exurban or developing areas usually need park-and-ride facilities as the patron travelshed is generally large and connecting bus service is less available and cost effective than at suburban or urban stations.

4.3.1.1. Enclosed Buildings at Transitway Stations

Transitway stations may include enclosed buildings when justified. Factors to consider in determining whether a transitway station should be an enclosed building include the following:

- Presence of circulation systems like elevators or escalators that provide access to transitway boarding platforms, such as at stations located in freeway medians
- Stations located within multiuse buildings, such as an airport terminal
- Transit transfer points with a total of 500 or more boardings per day for all routes serving the station or scheduled wait times of over 20 minutes to transfer between transit modes
- Site conditions including spatial constraints such as available right-of-way

4.3.1.2. Transitway Station Circulation System Hierarchy

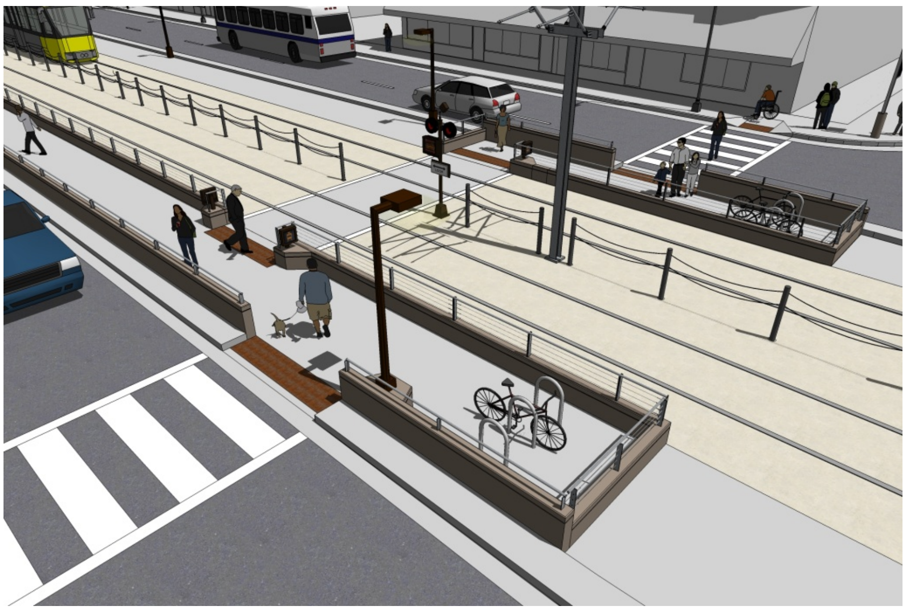
Stations include circulation systems, which may include pedestrian, bicycle, bus, auto/taxi pick-up and drop-off, park-and-ride, and bus layover facilities. A hierarchy should be followed to give priority of access – directness of route and proximity to platforms – to transit patrons in the following order:

- Pedestrians
- Bicyclists
- Feeder buses and shuttles
- Taxi and auto pick-up/drop-off
- Auto park-and-ride

4.3.1.3. Pedestrian and Bicycle Access

Special attention should be given to providing convenient and safe bicycle and pedestrian, including wheelchair users', access to and through transitway stations.

At-grade station access paths, including track and roadway crossings, should be used where feasible. Pedestrian and bicycle paths should be designed to provide the most direct route, paved, clearly marked, lighted, and buffered to improve bicycle and pedestrian experiences and discourage people from crossing tracks or roadways in other than designated areas. Improved bicycle and pedestrian facilities include features such as more visible crossings using pavement treatments, colors, or markings, pedestrian refuge medians, roadway curb extensions, intersection countdown timers, or crosswalks with passive crossing control. The Central Corridor LRT figure below illustrates a pedestrian crossing at a non-signalized intersection on University Avenue. Mid-block crossings between stations and street intersections should be avoided.



Source: CCLRT Project Office

Roadway modifications that improve bicycle/pedestrian experiences should also be considered and implemented when feasible. Roadway modifications include features such as adjusted intersection traffic signal timings to accommodate bicycles/pedestrians, additional traffic signals, elimination of conflicting turn movements such as free-right turn movements, and intersection modifications to provide more convenient and safe bicycle and/or pedestrian crossings.

Grade separated bicycle/pedestrian crossings may be considered per the guidance in Section 4.3.5.

Because on-vehicle bicycle storage is limited, bicycle parking should be provided at transitway stations. Due to increased capacity and usage and lower maintenance cost, bicycle racks are preferred to lockers except when substantial space and bicycle demand exists. Covered bike parking and security amenities (such as cameras) may be provided commensurate to available space and station technology investments.

4.3.1.4. Passenger Waiting Area with Weather Shelter

Together with platforms, passenger waiting areas function as primary features of a transitway station. All transitway stations should provide one or more weather shelters for waiting passengers. Shelters and canopies should be constructed to ADA standards and provide protection for passengers from snow, rain, wind, and sun. Shelters are generally free-standing structures, but may be incorporated into other buildings.

Shelter design should consider passenger safety, passenger comfort, functional similarity, and ease of maintenance. Factors to consider in sizing shelters include average peak period passenger usage, length of average wait time, location-specific conditions such as wind, and optimized sight lines. Shelters may be enclosed (provision of enclosed buildings is discussed in Section 4.3.1.1), or may consist of overhead canopy alone, overhead canopy with transparent windscreens, or structures with both roof and transparent walls to permit easy surveillance.

Shelters should be designed to maximize the benefit of overhead radiant heat, where heat is provided. Shelters should not impede passenger circulation and ease of movement to platforms.

At transfer points, sheltered waiting areas should be provided for all connecting modes at the location(s) of the connections. As an example, the Franklin LRT station positively integrates the street-level bus stop/waiting area with the LRT station entrance.

4.3.1.5. Transitway Boarding Areas – Platforms

All transitway stations should include platforms constructed to ADA standards or better that allow passengers to board and alight from transitway vehicles. Transitway stations not incorporated into a transit oriented development should provide platform access following direct, accessible routing. For these stations, the maximum walking distance from parking or drop off space to the nearest platform access point should be 1,000 feet *(source: CCLRT Design Criteria)*. Access paths to platforms should:

- Be visible from access drives and parking areas
- Avoid crossing or passing through runningways, vehicular access drives, and parking areas

Transit stations developed as part of TOD should coordinate platform access, sight lines, and safe crossing paths with the development team to maximize transit patron-friendliness within the development.

For median platforms, access to platforms should be clearly marked and managed with traffic signals at roadway intersections, signage and railing or fencing to discourage patrons from crossing elsewhere.

Waiting areas along local streets for connecting buses should be designed with clear visibility and sight lines.

Pedestrian and bicycle platform access to transitway stations located within local streets is addressed in Section 4.4.3.

4.3.1.6. Short-term Transit Patron Pick-up/Drop-off

Transit patron drop-off and pick-up activities (“kiss-and-ride”) should be expected at all stations and should be considered in the design process. As short-term pick-up activity tends to involve longer wait times than drop-off, off-street areas for pick-up should be provided wherever possible. Where both bus connections and pick-up/drop-off functions are provided, closest proximity to the platforms should be designed and designated for bus patrons.

4.3.1.7. Transit Center

Transit patrons may transfer to the transitway from local bus routes at some stations. Depending on the scale of the station and the number of feeder buses connecting at the station, bus drop off areas may be located on adjacent streets or facilitated by surface parking along the runningway. Where both bus connections and pick-up/drop-off functions are provided, closest proximity to the platforms should be designed and designated for bus patrons.

4.3.1.8. Park-and-ride

Where transitway market analysis demonstrates a need and local policy permits, parking areas for patrons may be provided adjacent to stations. Park-and-ride facilities may be surface lots or multilevel structures. Surface lots are generally preferred for cost reasons, but the type, size, and footprint of the parking facility should be evaluated to achieve the best balance between available space and cost.

The Metropolitan Council's *2030 Park-and-Ride Plan* identifies design criteria and three common types of land ownership strategies used for park-and-ride facilities: public right-of-way, joint-use opportunity, and private land. The design criteria fall into two groups, essential and preferred.

Essential design criteria for park-and-ride sites include:

- Serve lower-density areas with less than full transit service coverage
- Be located on a major travel corridor to a major regional activity center
- Offer convenient access to the regional highway system, typically within ½-mile of the nearest interchange or intersection accessing the regional highway system.
- Offer convenient vehicle access into and out of the facility
- Consider local area factors including community or land use compatibility, environmental constraints, and economic implications.

Preferred park-and-ride design criteria are:

- Located in congested travel corridors
- Located upstream of major traffic congestion
- Located within travel corridors with continuous transit advantages
- Located so as to minimize transit travel time to a major activity center
- Located to provide good visibility from primary roadways
- Located on the inbound side of primary roadway access
- Located on sites with future expansion potential
- Surface (preferred) or structured parking
- Transit center synergy

Station parking shall include ADA-accessible parking and should be designed to provide the most direct pedestrian paths to station platforms.

4.3.1.9. Transit Layover

When a transitway station is also the terminus of a transitway or a feeder bus route, off-street bus layover areas should be provided that include bus access drives and layover area with adequate turnaround space. Bus layover facilities should be provided off-street whenever possible and paved with asphalt or concrete.

Rail layover space may be provided through tail track, station platform space (with track crossovers as needed), or other means.

Bus layover facilities should be positioned so as to not impede passenger functions at a station, including access to station platforms.

Depending on transit service plans, station gates may provide layover parking for buses, provided they do not impede revenue service.

Transit operator restrooms should be provided for at stations which function as layover facilities and at terminal stations. Where provided, such facilities should be as described in the *CCLRT Design Criteria* (available from Metro Transit on request). Public restroom facilities are addressed in Section 4.3.3.6.

4.3.2. Sizing Station Facilities

Transitway station facilities should be sized in accordance with level-of-service C or better capacity standards cited in the *CCLRT Design Criteria*, which consider the projected number of patrons during peak 15-minute intervals. Site elements such as fare vending equipment should be sized and located so as not to block pedestrian flow. *(source: CCLRT Design Criteria, Sec. 6.4.2.)*

4.3.2.1. Pedestrian and Bicycle Facilities

Platforms, shelters and waiting areas should be designed with pedestrian and wheel chair users' safety and comfort in mind. Minimum pedestrian/wheelchair path clear width should be 6-feet, with 8-feet preferred. Specific components should be standardized throughout the system, and follow material and maintenance recommendations as described in the *CCLRT Design Criteria*.

The number of bicycle parking spaces should be based on anticipated ridership and spatial constraints.

4.3.2.2. Passenger Waiting Area

A station's public occupancy area consists of all areas in which patrons may be allowed to enter. Passengers primarily wait on platforms, but may also wait within other elements of the station such as plazas, ramps, and passageways. Passenger waiting areas should be sized based on Minnesota State Building Code square footage-based criteria for sizing public occupancy areas for safe exiting. *(source: CCLRT Design Criteria, Sec. 2.2.7.)*

4.3.2.3. Sheltered Area

Canopied shelter from snow, wind, rain, and sun should be provided to accommodate average peak hour, per-vehicle passenger volume projected for that station and shelter fare vending and validation equipment when necessary. Shelter size will vary depending on passenger loads and typical wait time. Bus shelters should provide a minimum of five square feet per person during peak period use *(source: CCLRT Design Criteria, sec. 6.6.4)*. Rail station shelters should assume an average of approximately 3.5- to 6-square feet per person (*source: TriMet Design Criteria Manual, rev. Jan 2010 Portland OR.)*

At Commuter Rail stations, a minimum of one shelter should be provided on each outbound platform. A minimum of two shelters should be provided on each inbound platform.

4.3.2.4. Platforms

Station platforms should be located along tangent track or BRT runningway to maximize level boarding capacity and minimize dwell times for transit vehicles.

Elevation - Station platforms for LRT and Commuter Rail will be designed for level boarding, following ADA requirements and the design criteria in the CCLRT and Northstar design documents. Platforms should have at least one elevated, accessible platform for ADA access.

LRT platforms should be one foot, six inches above the top of adjacent LRT rails. Commuter Rail platforms should be eight inches above the top of adjacent rails, except for special ADA circumstances addressed in Northstar design criteria.

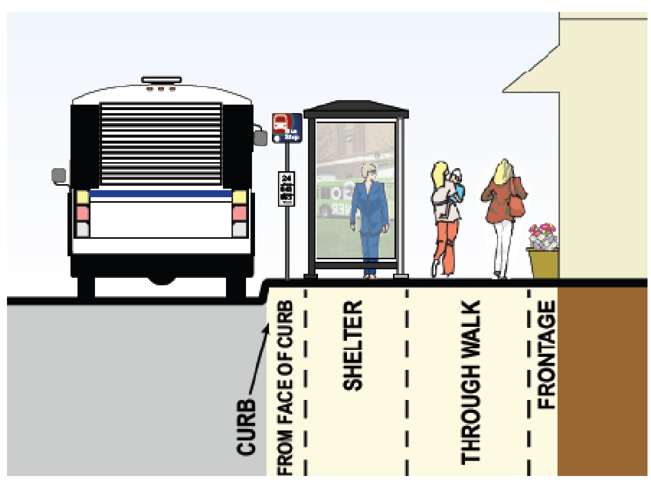
For BRT, station platforms should accommodate all transit vehicles serving the station. Raised curbs should be installed where practical, depending on platform width, stormwater considerations, and ADA requirements. This may allow for level boarding (roughly 13 inches above runningway) or higher curb heights (approximately ten inches above runningway) to facilitate rapid boarding. Standard curb height platforms (approximately six inches above runningway) are acceptable for lower volume stations or in constrained rights of way. Higher curbs may be more feasible where curb extensions are constructed. Curb heights should reflect drainage needs and accommodate snow and ice removal.

Width - The desired minimum platform width for LRT platforms should be 20 feet for center platforms (preferred) and 13 feet (12 feet absolute minimum per *CCLRT Design Criteria*) for side platforms. Platform width should include space for a safety barrier along the platform edge opposite the track when there is a grade difference of two feet, six inches or greater, or adjacent to a roadway.

The recommended standard platform width for Commuter Rail platforms is 26 feet for side platforms (13 feet absolute minimum per *Northstar Design Criteria, September 2006*, which includes no space for shelters, lighting, fare collection, etc. on the platform). Platform width should include space for a safety barrier along the platform edge opposite the track when there is a grade difference.

Minimum Highway BRT platform width should be 20 feet for center platforms (preferred for highway on-line BRT stations), 12 feet for side platforms for on-line BRT stations.

Arterial BRT platforms are the boarding areas provided by sidewalks and sidewalk extensions. Ten-foot width is the desirable minimum, but dimensions may vary depending on spatial constraints. For Arterial BRT, ADA requirements (minimum width of eight feet perpendicular to curb) are applicable at both boarding and alighting doors.



Source: Access Minneapolis, Design Guidelines for Streets and Sidewalks, Chapter 10 Pedestrian Facility Design

For all platform types and all modes, the platform should include a continuous clear space free from surface utility infrastructure and street furniture for the length of the platform. For LRT stations, preferred width from platform edge to obstruction should be eight feet; minimum width is six feet, eight inches *(source: CCLRT Design Criteria, sec. 6.12.3.3)*. For Commuter Rail stations, minimum width is 15 feet from the track centerline to any obstruction more than eight inches higher than the top of rail.

Length - Platform length should correspond to the number of passenger vehicles stopped at the platform at any one time.

For LRT, minimum platform length should be 270 feet, to accommodate a three-car train (consist). Station design must consider through-routing with other routes and accommodate expected train lengths for applicable routes.

For Commuter Rail, each passenger car is 85 feet long. Platform length should be a minimum of 425 feet to accommodate a five-passenger-car train, with expansion capability to 600 feet at a minimum. It should be noted that special event service may require additional platform length, which should be negotiated with the owning railroad.

BRT platform length will vary based on the size of buses and the operating plan for the number of buses concurrently at a station platform. For Highway BRT stations, minimum platform length should be 120 feet to accommodate two articulated buses or over the road coaches concurrently. Arterial BRT will use sidewalks and sidewalk extensions to provide platform or boarding areas. Arterial BRT station boarding areas lengths should be 60 to 80 feet to facilitate boarding at all doors for one articulated or two standard buses, depending on the branded vehicle type(s) to be used for the service.

Platforms may be constructed in stages, but right of way for both platform extensions and runningway alignments to clear expanded platforms should be planned to accommodate future extensions.

Platform - Center platforms are preferred for LRT and Highway BRT in freeway medians; side platforms for Commuter Rail and Highway BRT inline or offline stations. Both center and side platform access should be provided at each end of each platform. Side platforms may also be accessed along their lengths. Offset (also called split-side) platforms are acceptable in limited rights of way and to accommodate left-turns.

BRT stations along non-freeway highway and arterial corridors may be placed near-side or far-side of intersections, or may be placed mid-block. Far-side placement typically positions the station for optimal integration with traffic signal priority systems.

Runningway crossings should be at least 30 feet from the end of rail station platforms. Clearance area for BRT stations may be shorter.

Grade Separated - Elevated, open cut or tunnel platforms may be accessed at the ends or by elevators and stairs or escalators within the platform area. Due to high costs, grade separated stations should be avoided wherever a feasible at-grade alternative exists.

4.3.2.5. Short-Term Transit Patron Pick-up/Drop-Off

Of the functions provided at all stations, short term auto pick-up and drop-off ("kiss-and-ride") is the most flexible. Off-street facilities should be considered and provided wherever feasible. Safety for transit patrons, and for adjacent traffic if the drop off is on an adjacent street, should be considerations in allocating space for this function at stations.

4.3.2.6. Bus Transfers

Space allocated for bus drop-off should be based on corridor service planning for the number of routes concurrently serving the station. Off-street facilities should be considered and provided wherever feasible. Safety for transit patrons, and for adjacent traffic if the drop-off is on an adjacent street, should be considerations in allocating space for this function at stations.

4.3.2.7. Park-and-ride Lots

Parking areas should be sized based on the market analysis methodology provided in Chapter 5 of the region's *2030 Park-and-Ride Plan* (Metropolitan Council, May 2010). Surface facilities are preferred, but structured facilities may be needed. Surface facilities may be developed into structured facilities over time as passenger demand and development interest grow.

Park-and-ride site selection criteria should include an assessment of opportunity for joint use with adjacent existing and projected land uses.

Analysis factors include community or land use compatibility, environmental constraints, and economic implications. Where those factors are conducive to a park-and-ride facility at a station, site selection criteria should include:

- Congested travel corridor
- Upstream of major traffic congestion
- Transit advantages
- Transit travel time to major activity center
- Good visibility from primary roadways
- Location on inbound side of primary roadway access
- Future expansion potential

Park-and-ride facilities should have an opening year demand of at least 150 spaces. Facilities with lower demand may not justify a park-and-ride investment and this demand should be accommodated in larger facilities along the corridor. Even with adequate parking demand, a small facility with fewer trips should not be located near a large facility, as increased service at the large facility will likely out-compete the smaller facility for nearby users.

4.3.2.8. Staged Development

The staged development of station facilities to support increases in passenger volumes should be considered in designing and preserving right of way for extensions to platforms and expansions of waiting and sheltered areas. Increased access needs for pedestrians, bicycles, feeder bus, drop-off, and parking where appropriate should also be considered. Staged conversion of surface parking facilities to structured ramps may occur as demand grows and development interest increases. Structured ramps might also be considered for future vertical or horizontal expansion during initial design.

4.3.2.9. Special Consideration at Specialized Facilities and Major Activity Centers

Specialized facilities and major activity centers hosting large-scale events may require additional consideration in sizing transitway station facilities. Specialized facilities and major activity centers hosting large-scale events include:

- Union Depot in St. Paul and Minneapolis Interchange
- Downtown Minneapolis and St. Paul, including the Capital Complex area
- The University of Minnesota Twin Cities

- Major sports facilities or convention centers such as Target Field, Mall of America Metrodome, University of Minnesota TCF Bank Stadium, and the Xcel Energy Center
- Major shopping/commercial centers such as Mall of America

When sizing station facilities at major activity centers, designers should address the potential for a station's heavier than normal use during special events by considering:

- Proximity to major activity center
- Projected ridership, including average daily, peak-period, and event
- Available space for fully loaded trains or buses

Stations projected to regularly experience heavy patronage during special events may need to provide facilities which exceed system norms.

4.3.3. Station Amenities

Because transitway stations generally serve higher daily passenger volumes, transitway stations typically include greater investment in amenities. Examples of amenities discussed below are climate control, lighting, patron seating, fare collection systems, litter receptacles, restrooms, pavement markings, landscaping/streetscaping, and public art.

4.3.3.1. Climate Control

Transitway station shelters should include overhead radiant heaters, controlled with on-demand pushbuttons. Environmentally-friendly options should be explored to increase long term sustainability.

In transitway stations such as transit centers with substantial interior building space, stations should be heated and passenger waiting areas should be cooled. Non-waiting spaces in transitway stations such as stairways or overpasses should be vented but not heated or cooled.

Passive cooling is preferred where feasible. Where air conditioning is required, geo-thermal or other environmentally friendly options should be explored to increase long-term sustainability.

4.3.3.2. Lighting

All stations should incorporate pedestrian, platform, vehicle circulation, and emergency lighting, selected and located to achieve the required illumination level for each element of the facility, consistent with the CCLRT and Northstar Rail design documents. Stations including park-and-ride facilities should also provide lighting in the parking areas. Lighting level and height should be specific to the needs of pedestrian/cyclist circulation and vehicular circulation, and illuminate any areas of potential hazard. Luminaries should be standard to maintain consistent color and level of light.

Lighting should complement station architecture and surrounding station elements. Special care should be taken to design station lighting and shelters to avoid "spill" light which could negatively affect adjacent land uses. Considerations should include reducing glare to transit operators.

Lighting should be waterproof and vandal-resistant. Lighting fixtures and poles should be designed for ease of maintenance, and readily serviceable by system maintenance equipment.

Consideration should be given to energy-efficient, low-maintenance lighting fixtures such as LED lighting.

4.3.3.3. Seating

Seating at stations may or may not be an element of waiting area design. Where seating is provided, materials should be selected to discourage use as sleeping facilities, and designed for ease of installation and repair. Seating may be replaced by leaning rails. Where provided, seating placement should prevent access to overhead heaters.

The location of seating should not impede patron access to station platforms. Transitway station seating, if provided, should be controlled by the lead transit organization. Advertising bench contracts may be pursued as part of a coordinated program tailored to the transitway implementation.

4.3.3.4. Fare Collection Systems

Any fare vending and validation equipment provided at stations should be convenient to passenger use and sheltered when necessary. Ticket vending machines or comparable technology should be provided at all rail stations, and all BRT stations should be constructed to support the inclusion of ticket vending machines.

4.3.3.5. Litter Receptacles

Blast resistant litter receptacles should be provided at all transitway stations to minimize litter and debris. Litter receptacles may be provided in passenger waiting areas rather than on platforms, based on local conditions with transit authority approval. At Commuter Rail stations, U.S. Department of Homeland Security requirements stipulate a minimum of two litter receptacles on platforms.

4.3.3.6. Restrooms

Transit operator restrooms should be provided for at stations which function as layover facilities and at terminal stations. However, transitway stations generally should not include public restrooms unless the station is part of a multiuse building or a major transfer point requiring significant wait times.

Where stations are located within, or they themselves qualify as, an assembly area according to the State Building Code, public restrooms may be provided. Evaluation criteria include the number of passengers, and the routine length of wait times of one hour or more. Where public restrooms are provided, stations should be staffed for security and maintenance.

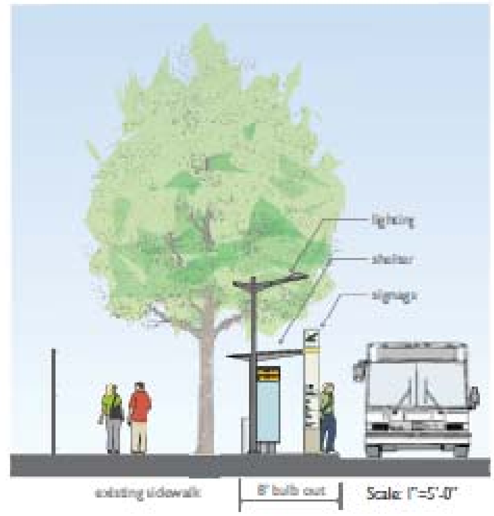
Public restrooms may be included as a local betterment as defined in Section 4.3.3.6.

4.3.3.7. Special Pavement Markings

Station site plans should include surface area striping and pavement markings such as required by the MnMUTCD to identify directional paths for station functions. Special pavement markings, which may include pavement texture and/or color changes should be used to indicate areas of special concern, including tactile warning strips of distinct color and/or texture from the platform surface marking the boarding edge of platforms.

4.3.3.8. Landscaping/Streetscaping

The intent of landscaping and streetscaping is to enhance a transitway station as a quality public space. This amenity may be considered in combination with public art, addressed in the following section. Both types of amenity seek to enhance station quality and attractiveness to transit patrons. Either technique can support this goal.



Station landscaping includes plant materials, mulch, and irrigation systems. Emphasis should be placed on low-maintenance plant material appropriate to Minnesota climate and soil conditions, including tolerance to sand/salt used to clear paths during winter. Prior to designing for natural plant material, irrigation needs should be considered; irrigation, an alternate engineered irrigation system, or an interagency agreement regarding watering is required where irrigation is essential to the life of the plants. Plantings that require no additional irrigation other than rainfall once the material is well-established are preferred. Landscaping that can assist in passive cooling or wind blockage to improve passenger comfort in waiting areas should be considered. Passive drainage, tied to stormwater maintenance wherever feasible, should be provided.

Station streetscaping (hardscape) may substitute for plant material or public art where streetscaping is more effective at enhancing the quality of the station area. Streetscaping elements should appropriate to the individual station setting, consistent with the surrounding community context, and cost-efficient to maintain.

Both landscape and streetscape design should:

- Provide clear sight lines which do not impede visibility to transit waiting passengers and transit vehicles in the runningway
- Avoid creating areas of concealment
- Avoid interference with pedestrians, bicycle, bus, and auto paths.
- Discourage vandalism
- Be easily accessible for maintenance

Landscaping within the above criteria which can assist in passive cooling or wind blockage to improve passenger comfort in waiting areas should be considered.

Streetscaping should:

- Be designed to complement surrounding community context
- Avoid interference with required traffic control and MnMUTCD provisions
- Avoid elements requiring non-standard maintenance procedures

Consistent with Federal Highway Administration (FHWA) guidelines, the cost of landscaping and streetscaping should be no more than five percent of the above-ground construction cost (i.e., the percentage should not be associated with the cost of underground utility relocation).

4.3.3.9. Public Art

Public art may be included at transitway stations. Funds spent on the art component of projects should be appropriate to the overall costs of the transit project and adequate to have an impact. These costs should be all-inclusive and generally should be at minimum one-half percent of construction costs, and should not exceed five percent of construction costs, with larger percentages typically associated with lower cost projects (*source: FTA Circular 9400.1A: Federal Transit Administration Design and Art in Transit Projects, June 1995*). The region currently spends between one-half and one percent of a station's cost on public art. Where possible, public art should be integrated into the functional elements of the station. The station railing at the 50th Street LRT station on the Hiawatha line is an example of effective public art as an integral station element.

Above the level stipulated in funding agreements, additional public art may be included as a local betterment as defined in Section 4.3.3.9.

4.3.3.10. Other Amenities

Concessions – Concessions should not be provided at free-standing stations. Concessions may be appropriate and should be considered when stations are incorporated in multiuse buildings

Newspaper vending – Stations may have a designated area for newspaper vending boxes. Where they are appropriate, such boxes should be secured. Vending equipment is prohibited on platforms and should not block passenger entry or exit from platforms or station entrances.

Acoustic treatments – Based on an assessment of benefits and costs, stations may consider acoustic treatment within shelters to mitigate ambient noise, for example, in Highway BRT median stations.

4.3.4. Transitway Passenger Information

One of the primary functions of transitway stations is the provision of transit information in and around station areas. Signage should incorporate the transitway branding scheme per direction in the Identity and Branding Guidelines. The placement and general content of signage should be consistent within station areas whenever possible. Signage should be designed to clearly guide passengers to and through the station and its functions, including passengers who are not familiar with the transit system, with disabilities, who are non-English speakers, and/or who are non-readers. Signs and graphics in transitway stations should be consistent with ADA, AASHTO, and MnMUTCD standards.

Station signage should offer system-wide consistency in materials, finishes, and placement to discourage vandalism as well as withstand normal wear. Signs may include some or all types of signage:

- Static: permanent signage of text and graphics/maps
- Changeable/Variable: printed information on routes, service times which may change and be updated by replacing hard copy material within protected display areas
- Real-time: electronic information providing current information on next train or bus, route number, and emergency conditions

In general, at least one variable message sign per station is recommended; real-time information may or may not be provided within that signage, as transit system information technology becomes available cost-effectively.

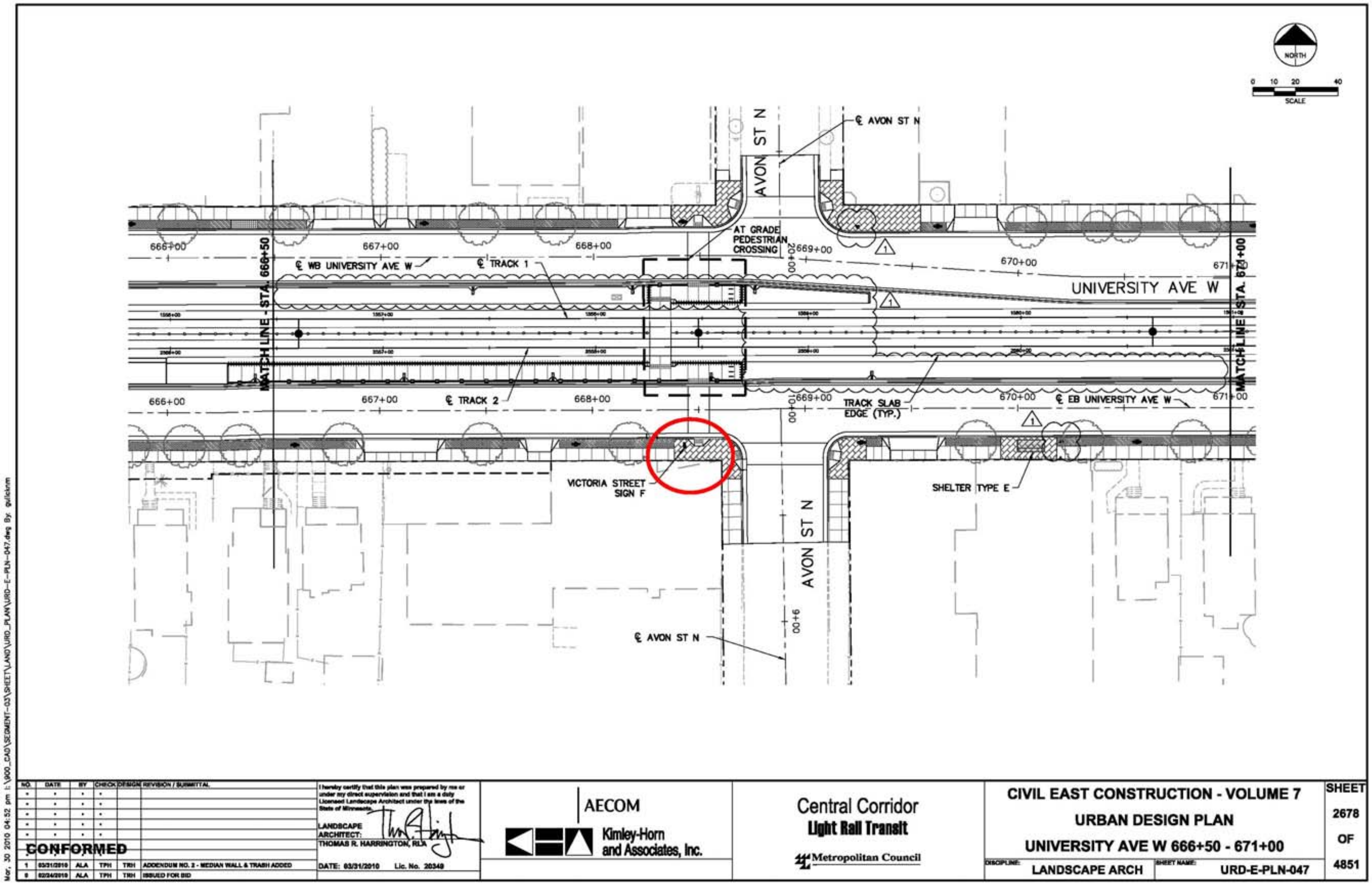
Station areas should include both route and service time information for transit patrons. Route identification, route and system maps, schedule information, and rider alerts should be provided within weather-proof kiosks or protected but visible portions of shelters. Schedule information may be static or real-time. Real-time information should be provided at high-volume stations wherever site conditions allow. Station areas may also include information regarding prohibited behaviors.

Station areas should include wayfinding information within the station area to platform entrances and exits, bicycle parking areas, bus drop off, short-term pick-up/drop- off, and, where provided, park-and-ride facilities. Station areas may also include wayfinding signs directing passengers to nearby public facilities that are permanent, major civic attractions in proximity to the station. Examples include City Hall, the State Capitol, museums, and other nearby transit facilities. Where budget permits, wayfinding signs may also include other major civic attractions such as nearby parks, recreational trails, stadiums, and public event centers close to the station. Wayfinding within the station area to businesses or other types of attractions nearby may be included as a local betterment as defined in Section 4.9. Wayfinding information may also be provided outside station areas to direct transit patrons to nearby transitway stations.

The number and placement of LRT, Commuter Rail, and Highway BRT station signage should be consistent with provisions described in the *CCLRT Design Criteria* and *Northstar Design Criteria* (available from Metro Transit on request). As an example, the Central Corridor LRT project budget provided for a minimum average of six wayfinding signs per station. The majority (generally four) are focused on station access at the nearest signalized intersection, with the remaining two signs on either side of the station access at an unsignalized intersection.

The figures which follow illustrate several wayfinding sign details from the Central Corridor LRT design documents.

At Arterial BRT stations, passenger signage should be distinctive to the Arterial BRT service. Arterial BRT station signage should be positioned to both signal the location of access to the service, and to identify the boarding location(s) at the station within the sidewalk area, extension or bulb-out serving as the station platform. Station signage should be closely coordinated with the local jurisdiction for clarity within neighborhood-scale commercial Arterial BRT corridors, which typically have multiple visible elements.


AVON ST N
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TRACK SLAB EDGE (TYP.)
℄ EB UNIVERSITY AVE W
VICTORIA STREET SIGN F
SHELTER TYPE E
MATCH LINE - STA. 666+50
MATCH LINE - STA. 671+00
CONFORMED
AECOM
Kimley-Horn and Associates, Inc.
Central Corridor Light Rail Transit
Metropolitan Council
CIVIL EAST CONSTRUCTION - VOLUME 7
URBAN DESIGN PLAN
UNIVERSITY AVE W 666+50 - 671+00
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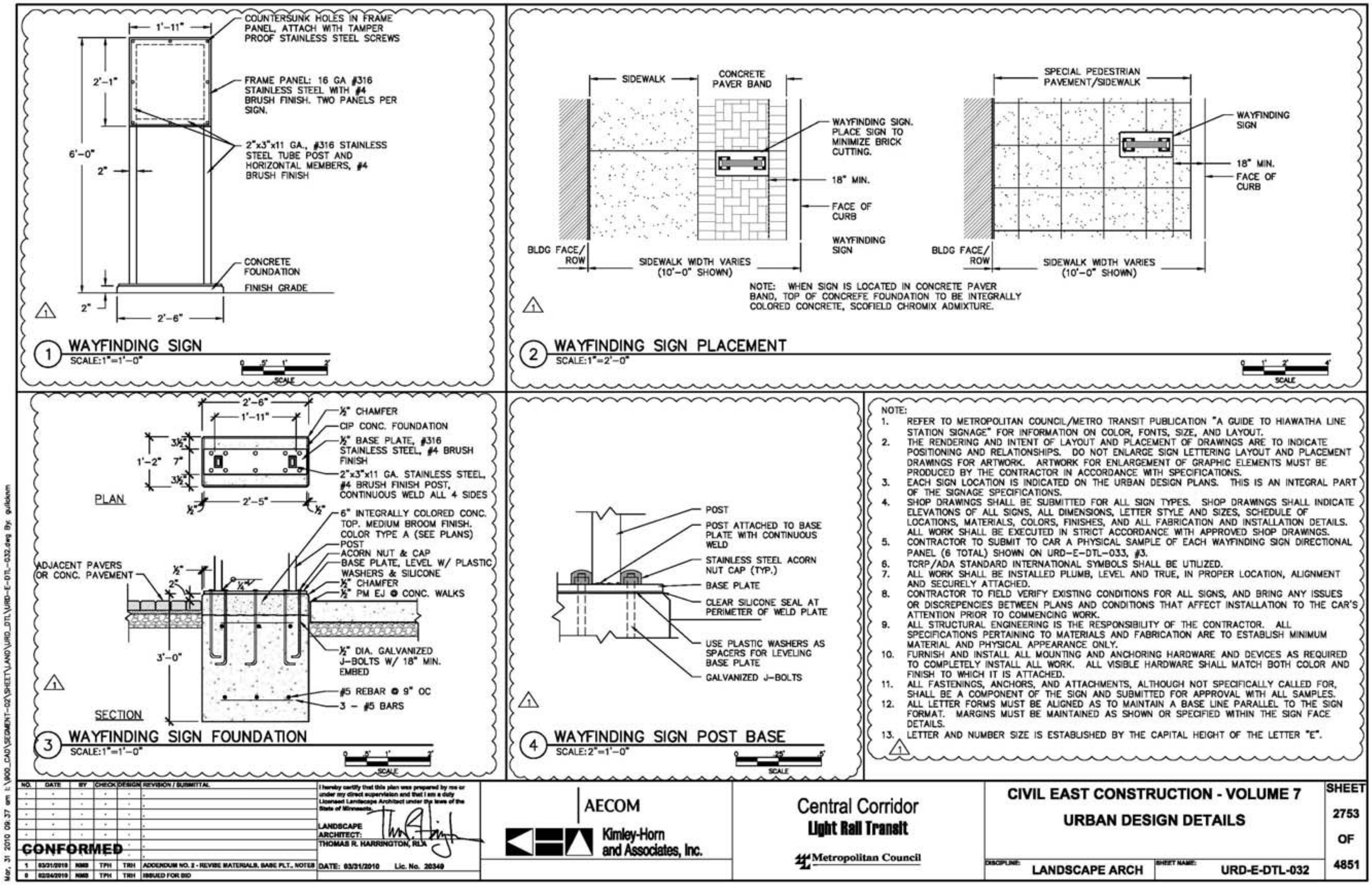
URD-E-PLN-047
SHEET 2678 OF 4851
LANDSCAPE ARCHITECT: THOMAS R. HARRINGTON, RLA
DATE: 03/31/2010 Lic. No. 20349
ADDENDUM NO. 2 - MEDIAN WALL & TRASH ADDED
ISSUED FOR BID


COUNTERSUNK HOLES IN FRAME PANEL. ATTACH WITH TAMPER PROOF STAINLESS STEEL SCREWS
FRAME PANEL: 16 GA #316 STAINLESS STEEL WITH #4 BRUSH FINISH. TWO PANELS PER SIGN.
2"x3"x11 GA., #316 STAINLESS STEEL TUBE POST AND HORIZONTAL MEMBERS, #4 BRUSH FINISH
CONCRETE FOUNDATION
FINISH GRADE
1 WAYFINDING SIGN
SCALE: 1"=1'-0"
SIDEWALK
CONCRETE PAVER BAND
WAYFINDING SIGN. PLACE SIGN TO MINIMIZE BRICK CUTTING.
18" MIN.
FACE OF CURB
WAYFINDING SIGN
BLDG FACE/ ROW
SIDEWALK WIDTH VARIES (10'-0" SHOWN)
SPECIAL PEDESTRIAN PAVEMENT/SIDEWALK
NOTE: WHEN SIGN IS LOCATED IN CONCRETE PAVER BAND, TOP OF CONCREFE FOUNDATION TO BE INTEGRALLY COLORED CONCRETE, SCOFIELD CHROMIX ADMIXTURE.
2 WAYFINDING SIGN PLACEMENT
SCALE: 1"=2'-0"
½" CHAMFER
CIP CONC. FOUNDATION
½" BASE PLATE, #316 STAINLESS STEEL, #4 BRUSH FINISH
2"x3"x11 GA. STAINLESS STEEL, #4 BRUSH FINISH POST, CONTINUOUS WELD ALL 4 SIDES
PLAN
6" INTEGRALLY COLORED CONC. TOP. MEDIUM BROOM FINISH. COLOR TYPE A (SEE PLANS)
POST
ACORN NUT & CAP
BASE PLATE, LEVEL W/ PLASTIC WASHERS & SILICONE
½" CHAMFER
½" PM EJ @ CONC. WALKS
ADJACENT PAVERS OR CONC. PAVEMENT
½" DIA. GALVANIZED J-BOLTS W/ 18" MIN. EMBED
#5 REBAR @ 9" OC
3 - #5 BARS
SECTION
3 WAYFINDING SIGN FOUNDATION
SCALE: 1"=1'-0"
POST
POST ATTACHED TO BASE PLATE WITH CONTINUOUS WELD
STAINLESS STEEL ACORN NUT CAP (TYP.)
BASE PLATE
CLEAR SILICONE SEAL AT PERIMETER OF WELD PLATE
USE PLASTIC WASHERS AS SPACERS FOR LEVELING BASE PLATE
GALVANIZED J-BOLTS
4 WAYFINDING SIGN POST BASE
SCALE: 2"=1'-0"
NOTE:
1. REFER TO METROPOLITAN COUNCIL/METRO TRANSIT PUBLICATION "A GUIDE TO HIAWATHA LINE STATION SIGNAGE" FOR INFORMATION ON COLOR, FONTS, SIZE, AND LAYOUT.
2. THE RENDERING AND INTENT OF LAYOUT AND PLACEMENT OF DRAWINGS ARE TO INDICATE POSITIONING AND RELATIONSHIPS. DO NOT ENLARGE SIGN LETTERING LAYOUT AND PLACEMENT DRAWINGS FOR ARTWORK. ARTWORK FOR ENLARGEMENT OF GRAPHIC ELEMENTS MUST BE PRODUCED BY THE CONTRACTOR IN ACCORDANCE WITH SPECIFICATIONS.
3. EACH SIGN LOCATION IS INDICATED ON THE URBAN DESIGN PLANS. THIS IS AN INTEGRAL PART OF THE SIGNAGE SPECIFICATIONS.
4. SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL SIGN TYPES. SHOP DRAWINGS SHALL INDICATE ELEVATIONS OF ALL SIGNS, ALL DIMENSIONS, LETTER STYLE AND SIZES, SCHEDULE OF LOCATIONS, MATERIALS, COLORS, FINISHES, AND ALL FABRICATION AND INSTALLATION DETAILS. ALL WORK SHALL BE EXECUTED IN STRICT ACCORDANCE WITH APPROVED SHOP DRAWINGS.
5. CONTRACTOR TO SUBMIT TO CAR A PHYSICAL SAMPLE OF EACH WAYFINDING SIGN DIRECTIONAL PANEL (6 TOTAL) SHOWN ON URD-E-DTL-033, #3.
6. TCRP/ADA STANDARD INTERNATIONAL SYMBOLS SHALL BE UTILIZED.
7. ALL WORK SHALL BE INSTALLED PLUMB, LEVEL AND TRUE, IN PROPER LOCATION, ALIGNMENT AND SECURELY ATTACHED.
8. CONTRACTOR TO FIELD VERIFY EXISTING CONDITIONS FOR ALL SIGNS, AND BRING ANY ISSUES OR DISCREPENCIES BETWEEN PLANS AND CONDITIONS THAT AFFECT INSTALLATION TO THE CAR'S ATTENTION PRIOR TO COMMENCING WORK.
9. ALL STRUCTURAL ENGINEERING IS THE RESPONSIBILITY OF THE CONTRACTOR. ALL SPECIFICATIONS PERTAINING TO MATERIALS AND FABRICATION ARE TO ESTABLISH MINIMUM MATERIAL AND PHYSICAL APPEARANCE ONLY.
10. FURNISH AND INSTALL ALL MOUNTING AND ANCHORING HARDWARE AND DEVICES AS REQUIRED TO COMPLETELY INSTALL ALL WORK. ALL VISIBLE HARDWARE SHALL MATCH BOTH COLOR AND FINISH TO WHICH IT IS ATTACHED.
11. ALL FASTENINGS, ANCHORS, AND ATTACHMENTS, ALTHOUGH NOT SPECIFICALLY CALLED FOR, SHALL BE A COMPONENT OF THE SIGN AND SUBMITTED FOR APPROVAL WITH ALL SAMPLES.
12. ALL LETTER FORMS MUST BE ALIGNED AS TO MAINTAIN A BASE LINE PARALLEL TO THE SIGN FORMAT. MARGINS MUST BE MAINTAINED AS SHOWN OR SPECIFIED WITHIN THE SIGN FACE DETAILS.
13. LETTER AND NUMBER SIZE IS ESTABLISHED BY THE CAPITAL HEIGHT OF THE LETTER "E".
CONFORMED
LANDSCAPE ARCHITECT: THOMAS R. HARRINGTON, RLA
DATE: 03/31/2010 Lic. No. 20349
AECOM
Kimley-Horn and Associates, Inc.
Central Corridor Light Rail Transit
Metropolitan Council
CIVIL EAST CONSTRUCTION - VOLUME 7
URBAN DESIGN DETAILS
LANDSCAPE ARCH
URD-E-DTL-032
SHEET 2753 OF 4851

4.3.5. Pedestrian/Bicycle Overpass/Underpass

Special attention should be given to providing convenient and safe access to transitway stations for patrons on foot, in wheelchairs, or traveling by bicycle. Grade-separated bicycle/pedestrian crossings may be considered where there is no technically feasible at-grade crossing option, where benefits to the broader transportation system are shown to be significant, or where required by the runningway's owning entity (e.g., railroad). Evaluation criteria that should be considered when assessing the need for grade-separated crossings include (*source: Design and Safety of Pedestrian Facilities: A Proposed Recommended Practice of the ITE, Chapter 10, "Grade Separated Crossings", Dec. 1998):*

- High pedestrian volumes
- Long pedestrian crossing distances
- Presence of poor sight distance to see crossing transit patrons
- Roadway average daily traffic volumes of more than 35,000 and 80th percentile speeds documented at more than 40 mph
- Distance of greater than 600 feet to the nearest alternative safe crossing (i.e., controlled intersection or existing overpass/underpass)
- Potential to coordinate with adjacent facilities such as a bike trail or sidewalk system

If an at-grade crossing is feasible, provision of a grade-separated bicycle/pedestrian crossing may be included as a local betterment as defined in Section 4.9.

Where required, a pedestrian/bicycle overpass or underpass structure should meet national, state and local clearance requirements of the affected highway, intersection, or rail line. Any overpass/underpass should also be on the normal path of travel whenever possible, and if not possible, use of fences, median barriers, railings, or other barriers may be needed to prevent transit patrons from crossing tracks or roadways at locations they believe to be more direct.

The FHWA also provides a *Pedestrian Safety Guide and Countermeasure Selection System* (http://www.walkinginfo.org/pedsafe/pedsafe_selection.cfm). Countermeasures recommended in that FHWA tool include narrowing the roadway, reducing the number of lanes, adding curb extensions, adding pedestrian crossing medians, and providing pedestrian crossing signals.

Pedestrian/bicycle overpass/underpasses should be open only during transitway service hours unless the overpass/underpass is part of a multiuse facility (e.g., trail, sidewalk system, or building). Special conditions will apply when an overpass/underpass connects to a building. Buildings may be locked during non-business hours, which may restrict the availability of any overpass/underpass for transit patrons. Overpass/underpass hours of availability should be considered early in the transitway design process.

4.3.5.1. Sizing and Visibility

Pedestrian/bicycle overpasses should be sized in consideration of factors including roadway authority or railroad requirements, ADA requirements, projected peak-period patronage, direction of patron access, relationship to park-and-ride facilities, and other relevant factors. A minimum overpass walkway width of ten feet should be considered to accommodate concurrent pedestrian traffic in both directions. Underpass width should consider the same factors, but an increased width and higher level of lighting should be provided for patron comfort and security.

4.3.5.2. Enclosure

Overpasses should be constructed with protective guardrails and fencing. In determining whether an overpass should be covered or enclosed, factors to consider include the following:

- Volume of pedestrian and bicycle transit patron usage
- Snow removal requirements and constraints (e.g., requirements to carry snow off an overpass rather than plow it off)
- Length and climate conditions of the facility to be overpassed (e.g., wind shear over a river or freeway)

Where functional and maintenance needs do not indicate a cover or enclosure is necessary, a community may opt to cover or enclose a pedestrian overpass and the enhancement would be considered a local betterment as defined in Section 4.3.5.

4.3.5.3. Climate Control

Non-waiting spaces in transitway stations such as pedestrian/bicycle overpasses and underpasses should be vented but not heated or cooled.

4.3.5.4. Lighting

Lighting should be provided in pedestrian/bicycle overpasses and underpasses to achieve required illumination levels for the safety and comfort of station users. Lighting components should be selected for ease of maintenance and cost-effectiveness. LED lighting should be considered.

4.3.6. Station Materials

Transitway station aesthetics are important and objectives should be accomplished through the choice of context-appropriate, durable, low-maintenance materials which are sustainable. The evaluation of sustainability should consider both a station's function as a high-use, high-traffic location, and Minnesota's natural environment. As an example of context-suitable materials, prairie grass landscaping is sustainable; rose bushes are not.

Materials for transitway station elements are provided in the CCLRT and Northstar design documents. General provisions address standardization for long life and cost-effective maintenance, repair and replacement. Materials should be difficult to deface, damage, and remove. Anti-graffiti coatings may be appropriate. Slip-resistant materials should be considered on passenger walking surfaces to account for snowy and rainy conditions. Readily available, standard materials are preferred. Such materials:

- Are compatible with the climate
- Have consistent wear, strength and weathering qualities
- Are capable of good appearance throughout their useful life
- Can be colorfast or integrally-colored
- Do not soil or stain easily
- Can be easily and cost-effectively maintained with commonly used equipment

The use of low volatile organic compounds (VOC) and water-based paints and solvents should be considered to reduce the amount of toxic waste to be managed *(source: Transit Sustainability Practice Compendium, APTA, August 2009)*.

4.4. STATION ENGINEERING

4.4.1. Coordination with Property Owners

Stations should be constructed on property owned by a public entity wherever possible. The lead agency should proactively communicate and coordinate with the property owner and directly adjacent property owners. Property owners may be residents, businesses, roadway authorities, institutions, public jurisdictions or agencies, or railroads.

The coordination process should be structured, transparent, and continuous throughout the station planning, design, and construction process.

4.4.2. Right-of-way Requirements

Right-of-way requirements for transitway stations should be identified during the facility planning process and no later than the conclusion of preliminary engineering. In determining right-of-way requirements, the lead agency should consider:

- Station functions to be provided
- Minimum and desired spacing for each station function
- Access paths/drives from roadways and trails
- Utility relocation requirements
- Drainage requirements, which may include holding ponds
- Other factors as appropriate

Property acquisition and disposal is discussed in Section 4.4.2.

4.4.3. Station Access from Local Street Network

Station access from the local street network should be a primary consideration in transitway station design to minimize adverse impacts on the neighborhood street, sidewalk, and bikeway network. Regardless of the presence of transit transfer and/or park-and-ride functions, drive access will be necessary for shuttles, taxis, short-term auto drop off, and station maintenance functions. Drive access should be designed to maintain the station's internal circulation hierarchy.

Where the drive access for either autos or buses is limited to drop-off along an adjacent roadway, separate space should be provided along that roadway to accommodate those functions. Special attention should be paid to avoid inhibiting access to adjacent property access points such as driveways and loading areas.

4.4.4. Bus Turning Radius, Staging Requirements

At minimum, transitway stations which provide a bus transfer or layover functions should be designed with spatial requirements and turning radii to accommodate both standard and articulated buses. Wherever feasible, stations with layover facilities should also be designed to allow over the road coaches.

4.4.5. Utility Relocation

Procedures and criteria governing design for the provision, consolidation, relocation, adjustment, protection, or other work related to public and private utilities necessary to accommodate transitway stations are provided in the CCLRT, Northstar, and state and local roadway design documents.

In addition to following the criteria in those documents, as recommended by APTA, the lead agency should demonstrate environmental stewardship by pursuing partnerships with local utilities to:

- Assess opportunities to reduce the total carbon footprint of the station
- Partner on projects that result in utility investment in alternative technologies that reduce station energy consumption
- Seek opportunities to consume and store energy during off-peak periods
- Optimize public investment in shared infrastructure

4.4.6. Roadway/Street Reconstruction Standards

Roadways which require reconstruction to implement a transitway station shall be reconstructed to the required standards of the owning roadway entity. Special attention should be given to providing convenient and safe at-grade accommodations for transit patrons crossing roadways on foot or bicycle.

4.4.7. Pedestrian Control

Consistent with the station circulation priorities noted previously, pedestrians should be provided with the closest, most convenient boarding area access. Pedestrian paths should avoid crossing or passing through transitway runningways, vehicular access drives, and parking areas wherever possible. Where such crossings are necessary, best design practices for pedestrian hazard notification and crossing design should be followed. Pedestrian refuge areas should be provided where appropriate.

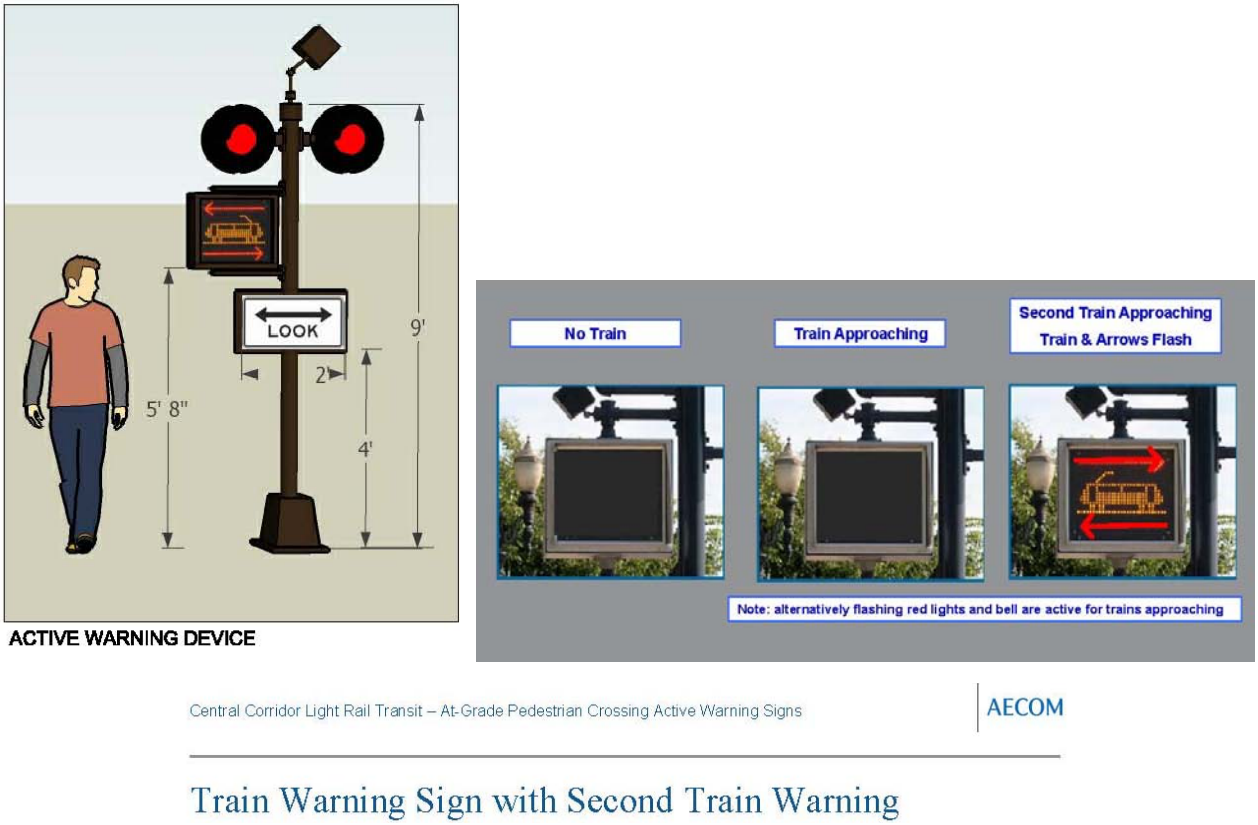
4.4.7.1. Gate Infrastructure

Pedestrian crossing gates should be provided at transitway stations based on an evaluation of specific conditions at individual stations. As a rule, pedestrian crossing gates separate from full roadway intersection control gates should not be considered standard.

4.4.7.2. Active Warning Systems

Active warning systems for pedestrians should be provided at transitway stations based on an evaluation of specific conditions at individual stations. As a rule, systems separate from full roadway warning systems should not be considered standard.

The figures below illustrate active warning devices for pedestrian and bicycle crossings at stations.



4.4.8. Signal System

Traffic and pedestrian crossing signals should follow MnMUTCD standards and be coordinated during the design phase with the jurisdictional authority, to give transit patrons safe, clearly indicated, and convenient access to transitway stations.

4.4.9. Station Fencing

Arterial BRT stations should not include fencing, as this type of transitway is intended to provide ready access from adjacent pedestrian facilities such as sidewalks.

LRT, Commuter Rail and Highway BRT station platforms should be fenced on the side not used to access the transitway at median stations, and where significant grade changes exist at side platforms. For these types of transitways, median and split side station areas should also include fencing to guide pedestrian crossings to authorized areas only.

Fencing at Commuter Rail stations is required between tracks to prohibit uncontrolled crossings.

4.4.10. Energy Conservation

Station design should incorporate features and materials which conserve energy, are low-maintenance, and cost-effective to construct and repair. Such features may include materials compatible with the climate, LED lighting, passive solar lighting and heating, or comparable advances in these technologies.

4.4.11. Parts Standardization

Transitway station materials should be standardized as much as possible for cost-effective repair and replacement. The “family of parts” approach is recommended to use low maintenance materials and minimize life-cycle costs. Coordination between transit operators to standardize station parts is recommended.

4.5. STATION OPERATIONS AND MAINTENANCE

The upkeep, repair and replacement of all station elements should be considered in designing station components, include landscaping, pavement, signage, structures, etc.

4.5.1. Opportunities for Shared Facilities

Where stations can be incorporated into existing facilities, such as commercial or public building frontages, operating and maintenance agreements should be developed with affected property owners.

4.5.2. Power Source and Backup Power

For LRT, Commuter Rail, and Highway BRT, each station should have its own power service, as stipulated in the *Northstar Design Criteria*. Arterial BRT stations may be powered via an adjacent electrical service, should be coordinated with the utility owner, and provided in accordance with the owner's standards.

Power should be sufficient to provide well-lit entrance and exit points for pedestrian access and egress to the station. Back-up or alternative power should be provided at stations to preserve safe lighting, communication operation and other safety-sensitive equipment such as gate crossing arms. Stations should be designed for power source redundancy, such that if power goes out at one station, those on either side provide enough to cover the outage.

4.5.3. Snow Clearance/Removal

Each circulation system (pedestrian, bicycle, auto, and bus paths and drives) within a transitway station should be designed to accommodate snow clearance and removal equipment. This factor should be considered in designing pavement treatments for pedestrian and bicycle paths, in particular, which do not require the pavement strength of driving surfaces.

4.5.4. Signage Maintenance

Directional, route information cases, and wayfinding signage should be designed following MnMUTCD and local jurisdictional guidance using the "family of materials" approach and efficient installation techniques for cost-effective maintenance and low life-cycle costs. Sign fixtures and poles should be no more than 40 feet high to permit servicing by a bucket truck. *(source: CCLRT Design Criteria).*

4.5.5. Litter Removal

Litter removal is a function of the transit agency for Commuter Rail, light rail, and Highway BRT where access to stations is restricted. Litter removal at Arterial BRT stations should be provided by interagency agreement.

4.5.6. Route Information Updates

Kiosks and other signage for route information should be designed to allow a single maintenance employee to change out information alone, including in harsh weather conditions (*source: CCLRT Design Criteria).*

4.5.7. Cleaning Standards

Cleaning should be facilitated and cleaning costs reduced by selecting the types of materials noted in Section 4.3.6. Surfaces should be selected for easy cleaning in a single operation with the use of standard equipment and cleaning agents.

Where custodial facilities are provided, such as in maintenance and layover facilities and/or terminal stations with operator restrooms, the custodial facility should have one mop sink with hot and cold running water, one hose bib, and a floor drain.

Environmentally-friendly cleaning products are recommended.

4.6. STATION SAFETY AND SECURITY

Transitway stations should be designed to promote safety and security. This includes the performance of Design Reviews and Hazard, Threat, and Vulnerability Analyses, as well as provision of station based communications and preparation for emergencies.

4.6.1. Design Review Process

During the station design process, an evaluation should be conducted to identify any elements which might a) inadvertently compromise the overall safety and security of the station area, and b) result in less than optimal long-term operating and/or maintenance requirements.

Sustainable options for station elements should be considered as technology improves the cost-effectiveness of more environmentally friendly materials and construction techniques.

Elements to be evaluated during station design review include:

- Sight lines for safety
- Unconstrained, unblocked access to platforms, entrances and exits
- Signage legibility
- ADA accessibility to all station elements
- Appropriate lighting
- Appropriate pavement markings
- Adequate vehicular turning radii
- Appropriate crossing locations, signage and surfaces
- Adequate roadway, pedestrian and bicycle access. Special attention should be given to providing convenient and safe at-grade crossing accommodations for transit patrons on foot, wheelchair, or bicycle.

4.6.2. Hazard, Threat and Vulnerability Analysis

Consistent with the requirements of both FTA and FRA, the transit operator should conduct a detailed risk assessment to pinpoint the possibility of hazards and potential areas of vulnerability within the station. The methodology should identify potential hazards related to persons (employees, passengers, pedestrians, and members of the general public), trains, buses, equipment, autos, and first responder vehicles which may use as station.

A detailed risk assessment assigns a level-of-risk (frequent, probable, occasional, remote, and improbable) and a level-of-hazard (negligible, marginal, critical, or catastrophic) to each identified hazard. Each of the risks identified should then be assessed to determine the potential for damage to property, personnel, and operations. Based on the level-of-risk and the estimated probability of the identified hazard occurring, priorities should be set to mitigate hazards. Recommendations to eliminate or control hazards should be identified and documented.

4.6.3. Crime Prevention through Environmental Design

The principles of crime prevention through environmental design should be used in the design of all stations, bus stops, park-and-ride lots, and other passenger facilities. Physical features and activities should be organized and placed in a manner that maximizes visibility and positive social interaction. Examples include using windows and open, transparent design to increase natural surveillance of spaces; avoiding blind spots and proving well-lit pathways, stairs, entrances/exits and parking areas; and keeping lighting, landscaping and fencing at appropriate heights and designs to maintain visibility. Access points should be limited and clearly identifiable, and design elements should be used to control the flow of people through the space. Design elements can also be used to naturally define public, semi-public and private space. Proper maintenance (both cleaning and repair) is a very important tool for minimizing vandalism and maintaining a sense of security. A good source of information is the International CPTED Association (www.cpted.net).

4.6.4. Station Based Communication

Transitway stations should include public address systems, closed circuit television, and emergency telephones.

4.6.4.1. Audio

LRT, Commuter Rail, Highway BRT stations, and whenever feasible Arterial BRT stations, should include a public address system, including both speakers and signs, to convey information to persons with disabilities in compliance with ADA requirements. Speakers and signs should be positioned to be clearly audible/visible, but not readily accessible to the public.

4.6.4.2. Video

LRT, Commuter Rail, Highway BRT stations, and whenever feasible Arterial BRT stations, should be equipped with closed circuit television to record activity, at a minimum, at ticket vending areas and platforms. Camera locations should be coordinated with the locations of other equipment such as lighting, audio equipment and signage. Cameras should be visible to the public, but not readily accessible.

Closed circuit television coverage will be operated and maintained in central control facilities.

4.6.4.3. Telephone

LRT, Commuter Rail, Highway BRT stations, and whenever feasible Arterial BRT stations, should incorporate an emergency telephone on or near the platforms for communication with the central operations center for that mode and emergency services. An emergency telephone is also recommended on every level of structured park-and-ride facilities, located near elevators.

Public telephones should not be provided at any station.

4.6.5. Training and Emergency Preparedness

Access to transitway stations in an emergency should be a design consideration. Coordination with emergency responders should be established and maintained via a documented plan developed with the concurrence of all agencies with jurisdiction over facilities adjacent to or connecting with transitway stations. Coordination should include ensuring access to transitway stations in emergency situations.

4.7. STATION COSTS

4.7.1. Capital

Capital costs should be estimated based on the one-time cost to build the stations. However, capital cost elements should take into consideration the life-cycle costs to operate and maintain each element before finalizing the station's elements.

Capital cost estimates should be developed consistent with the FTA's Standard Capital Cost (SCC) organization, unless the organization with governance over the funding of the system establishes another approved methodology. FTA SCC estimates address the following station elements:

- Platforms
- Shelters
- Canopies
- Fixtures
- Elevators/escalators/stairs
- Auto parking lots/structures
- Bicycle parking facilities
- Access drives/paths
- Sitework and special conditions (e.g. Demolition, clearing, earthwork; soil and water remediation, environmental mitigation, roadway/intersection/sidewalk reconstruction, landscaping, fencing, and lighting)
- Communication systems
- Fare collection systems
- Traffic signals
- Right of way acquisition
- Property relocation
- Professional services (e.g. Engineering, project management for design and construction, insurance, legal, permit fees, surveys, and soil testing)
- Finance charges

Capital costs should include contingency estimates for each item, appropriate to the level of design development and precision.

4.7.2. Operating and Maintenance

Operating and maintenance costs for stations should be incorporated into overall corridor operating or service plans. To identify those costs applicable to the operation and maintenance of stations themselves, the following should be considered:

- Labor costs for cleaning, and snow clearance personnel
- Labor costs for updated service/route information
- Utility costs for lighting, signage, communication, plumbing where restrooms are provided, and refuse removal
- Replacement parts, materials, and cleaning supplies
- Insurance

4.8. TRANSITWAY SUPPORT FACILITIES

The need for transitway support facilities should be identified during transitway planning and design to ensure that adequate facilities are provided for these functions. Transitway support facilities should address daily vehicle storage and cleaning, major vehicle maintenance, central system control, and/or rail systems maintenance. Other elements of runningways, including power substations and traffic signals, are discussed in the Chapter 5: Runningways.

4.8.1. Support Facility Requirements

Transitway support facility design should comply with all laws, rules and regulations cited earlier in this document, and local ordinances governing support facility locations.

The requirements within support facilities should be based on the specific program identified for each facility. For a stand-alone support facility, planners and designers should consider the following:

- Exterior - materials should be selected based on durability, low-maintenance, and appearance
- Interior - materials should be durable and low-maintenance
- Structural – materials should be approved for fire-resistant construction, snow build up/loads, floor loads, wind loads, and seismic forces
- Lighting – appropriate to the functional needs to be lit within and surrounding the support facility
- Acoustics – noise-generating equipment should be located away from office areas and should be insulated to reduce noise transmission. Acoustics should be a major consideration when buffering the facility from non-industrial land uses such as residential and commercial uses

Major maintenance facilities for LRT and Commuter Rail should include a drop table to provide the ability to remove and replace wheels on a train (source: Northstar Maintenance Superintendent).

Support facilities should be enclosed by a perimeter security fence. The fence should be a minimum of six feet high and of chain-link or other approved material and type (*source: Portland TriMet Design Standards, Jan 2010*).

4.8.2. Layover and Turnaround

Sufficient space should be provided at vehicle storage and maintenance facilities to accommodate the bus or rail fleet planned to use the facility. Both internal and external space requirement should be considered in identifying the layover and turnaround facility needs. Planners and designers should consider the following:

- Level rail car storage areas – including paved access aisles between the tracks to allow safe movement of workers around trains
- Rail run-around loop (track) – to allow railcars multiple access points to the functions of the facility
- Parking – for employees and visitors
- Storage building(s)
- Outside storage areas
- Fire protection systems
- Yard lighting
- Security
- Refuse/recycling collection
- Landscaping
- Vehicle wash facility
- Administrative area

4.8.3. Control Center Expansion Needs

As additional transitway corridors come on-line, the capacity of the central control center(s) to accommodate staffing, communication equipment, and other administrative space needs should be evaluated.

4.8.4. Redundancy

Transit support facilities should be equipped with backup systems for electricity, water, and communications.

4.9. LOCAL BETTERMENTS

Transit station and support facility enhancements beyond the base elements described above are considered local betterments that require a local commitment of funding for capital, operations and maintenance. Local betterments may be included in the transitway project when the enhancement is consistent with and complements the station or support facility’s community context, adds to passenger comfort and/or interest, and funding of its added capital, construction/installation, operation, maintenance, repair, and refurbishment/replacement has been negotiated and implemented through interagency agreement.

Local betterments are any improvements to typical transitway designs that a local community desires which add capital and/or operating/maintenance cost. Examples of local betterments may include public restrooms at stations and park-and-rides, enhanced landscaping, streetscape, or public art, enhanced wayfinding to businesses or other attractions outside the station area, grade-separated bicycle/pedestrian crossings where an at-grade crossing is feasible, or enhanced components, materials, and/or finishes at stations.

The desire for these kinds of improvements, whether requested by local communities or required by local zoning and design requirements, should be acknowledged by the lead organization and reflected early in the station design process. Early coordination should include a local commitment to fund the added cost of design, construction, ongoing maintenance and repair, and periodic refurbishment and/or replacement of the betterment. Cost participation for betterments should be negotiated during the design process and implemented through interagency agreement.

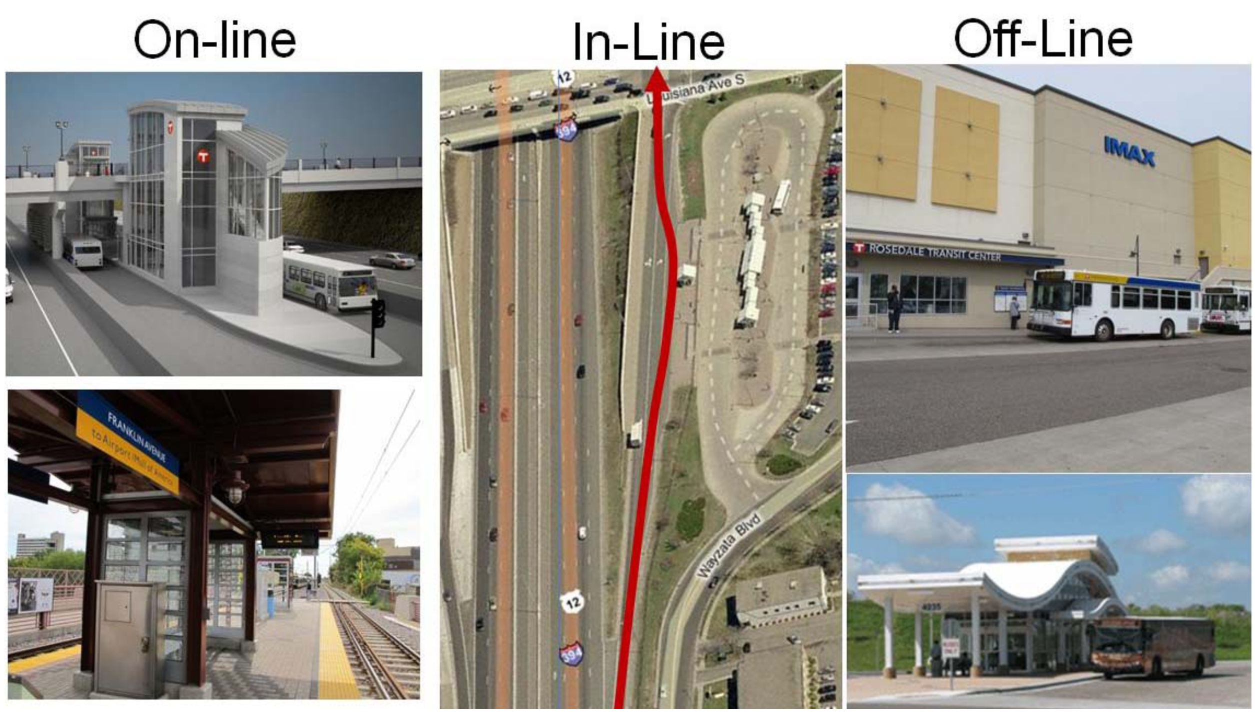
4.10. STATION AND SUPPORT FACILITIES GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Advisory Committee, and Metropolitan Council and Metro Transit senior staff, the following Station and Support Facilities Guidelines are recommended for adoption. These guidelines should be considered collectively when making station and support facility decisions for transitways. The guidelines are summarized and discussed below.

A transitway station is a place on a transitway where scheduled vehicles stop during every trip. Three types of transitway stations have been defined as illustrated in Figure 4-1:

- Online – Online stations are located within the vehicle runningway and the transitway vehicle can access the station without leaving the runningway. Examples of online stations in the region include all LRT and Commuter Rail stations, the I-35W South BRT station at 46th Street, the Apple Valley Transit Station on Cedar Avenue, and the Lakeville Kenrick Park-and-Ride.
- Inline - Inline stations are located adjacent to the vehicle runningway, typically along freeway interchange ramps. Although they require the transitway vehicle to exit the primary runningway, they provide a fast opportunity to access a station and immediately return to the runningway. Few or no turns are required. Examples include the I-35W South BRT stations at 66th Street and future stations at 82nd Street and 98th Street.
- Offline - Offline stations require transitway vehicles to exit the runningway and require several turning movements and potential traffic delays that impact transitway service speed and reliability, especially during peak travel times. Examples of current offline transitway stations are Cedar Grove Transit Station and Burnsville Transit Station.

Figure 4-1 Transitway Station Types



A transitway station may be included in one or more of the categories. For example, the I-394 Louisiana Avenue station is an inline station for inbound trips, but offline for outbound trips. Consistent with Station Spacing and Siting Guideline 3.4.2 – Transportation Site Location Factors, all rail stations should be online stations. Online or inline stations are preferred for highway and arterial BRT. Hybrid inline-offline stations should be implemented for Highway BRT service where online stations are not feasible, with the inline configuration provided for the inbound direction of travel. For all modes, end of line stations may be offline.

4.10.1. Guiding Principles

Transitway stations and support facilities should fit in with and enhance the neighborhoods surrounding them. Transitway stations and support facilities should be functional, attractive, cost-effective, and generally consistent by transitway mode across the region. Station and facility designers should work to:

- *Achieve an attractive, informative environment for passengers at stations that is consistent with local community context, transitway identity, and passenger waiting times*
- *Achieve functional integration with the surrounding land uses, which may include forming a nucleus for transit-oriented development at stations*
- *Promote a safe and secure environment by designing all elements to enhance passive security by maintaining visibility to and within the station and station area*
- *Implement an interdisciplinary approach to station and facility design that incorporates advancements in technology*
- *Achieve a functional, cost-effective outcome that balances aesthetics with funding availability*

Stations serving specialized facilities such as Union Depot in St. Paul, the Minneapolis Interchange, and major event and sports venues (e.g., the Capitol Complex, Target Field, Mall of America Metrodome, University of Minnesota TCF Bank Stadium, Xcel Energy Center) require special considerations. National expertise or guidelines are likely most appropriate.

For all other stations, consistency across the transitway system includes such elements as system signs, maps, structural elements, materials, and power systems. Other elements that may be custom and responsive to site-specific conditions and neighborhood context may include kiosks, pavement patterns, handrails, bike racks, benches, and retaining walls.

Coordination with and engagement of partner implementation and affected agencies, stakeholders, and the general public are critical responsibilities of the organization leading transitway planning and design, including stations and support facilities, as identified in the Project Development, Leadership, and Oversight Guideline – Coordination of Agencies and Stakeholders.

4.10.2. Transitway Station Facilities

One of the primary functions of transitway stations is providing passengers access to the transitway. To accomplish this function, all transitway stations should include:

- *Facilities that support access for pedestrians and people using wheelchairs or bicycles, including providing bicycle parking*
- *Station platform(s)*
- *Waiting shelters for all public transit routes serving the station and*
- *Provision for short-term pick-up/drop-off areas for transit passengers.*

Some stations may also serve as transit transfer, transit layover, and/or park-and-ride locations. The major factors to consider when identifying these additional facilities to provide at each station are existing and future:

- *Passenger demand*
- *Market needs*
- *Transit service plans (transitway and other public transit services)*
- *Capital and operating costs*
- *Available right-of-way*
- *Consistency with surrounding development and land use*

Transitway station access is discussed in more detail in the Stations and Support Facilities Technical User's Guide (available upon request).

All transitway stations must serve people arriving or leaving by foot, in wheelchairs, on bicycles, and being dropped-off or picked-up by a car and the elements listed in this Guideline are essential to this role of a transitway station. Some stations may also provide access for transit transfers, transit layover, and/or park-and-ride locations but the provision of additional facilities depends on the considerations listed above. Additional Guidance relating to transfer locations, including boarding and wait times, is in the Transitway Station Enclosure Guideline. A hierarchy of station circulation and related elements is included in the *Stations and Support Facilities Technical User's Guide*.

4.10.3. Transitway Station Enclosure

Transitway stations may include enclosed buildings when justified. Factors to consider in identifying the need for an enclosed transitway station include the following:

- *Presence of circulation systems like elevators or escalators that provide access to transitway boarding platforms, such as at stations located in freeway medians*
- *Stations located within multiuse buildings, such as an airport terminal*
- *Transit transfer points with a total of 500 or more boardings per day for all routes serving the station or scheduled wait times of over 20 minutes to transfer between transit modes*
- *Site conditions including spatial constraints such as available right-of-way*

Passenger waiting areas in fully enclosed buildings should be heated and cooled. If the station is a standalone building and includes no other uses, interior temperatures should be consistent with state law and rules. Passive cooling is preferred where feasible. Where air conditioning is required, geo-thermal or other environmentally responsible options are preferred to improve long-term sustainability. Non-waiting spaces in buildings such as stairways or overpasses should be vented but not heated or cooled.

Enclosed buildings at transitway stations provide a high level of passenger comfort but incur significantly higher construction and maintenance costs. Because most transitway services operate at high frequency (such as light rail services) or during short periods of the day (such as commuter rail), an enclosed building investment may not yield significant benefits at most stations. Providing a building enclosure should be reserved for high volume stations or when station equipment requires protection from elements.

An example of a state rule regulating interior temperatures in buildings is Executive Order 05-16, Providing for Energy Conservation Measures for State Owned Buildings. Heating and cooling systems are expensive to maintain and operate and generally only provide benefit at stations with many waiting passengers or routine, long wait times. Because passengers will generally only be passing through non-waiting areas, heating and cooling is not necessary in these areas.

4.10.4. Transitway Station Sizing

Transitway station facilities should be sized based on the projected number of patrons during peak 15-minute intervals in the year of opening. The sizing of specific elements includes the following parameters.

- *The number of <u>bicycle parking spaces</u> should be based on anticipated ridership and spatial constraints. Bicycle racks are preferred to lockers except where substantial space and bicycle demand exists.*
- *<u>Waiting shelters</u> shielding transit patrons from snow, wind, rain and sun should be sized based on average peak hour, per-vehicle passenger volumes projected for the station and accounting for typical wait time. Shelters should provide 3.5- to 5-square feet per person. At Commuter Rail stations, a minimum of one shelter should be provided on each outbound platform, and a minimum of two shelters on each inbound platform.*
- *In general, <u>LRT platforms</u> should accommodate three-car trains (270 feet) and <u>Commuter Rail platforms</u> should accommodate a minimum of five-car trains (425 feet) with expansion capability for longer trains (600 feet minimum, or longer to accommodate special service, as required by the railroad). <u>Highway BRT platforms</u> should be sized to accommodate two articulated buses or over the road coaches (120 feet) and <u>Arterial BRT platforms</u> should accommodate one articulated or two standard buses (60 to 80 feet) depending on the vehicle to be used for the service. Platform sizing for all modes is discussed in more detail in the Stations and Support Facilities Technical User's Guide (available upon request).*
- *<u>Park-and-ride lots</u> may be surface lots or multi-level structures. Surface lots are generally preferred for cost reasons, but the type, size, and footprint of the parking facility should be evaluated to achieve the best balance between available space and cost. The Metropolitan Council's 2030 Park-and-ride Plan (May 2010) provides design guidance for park-and-ride lots, parking areas should be sized based on the market analysis methodology provided in Chapter 5.*

The staged development of station facilities should be considered when planning, designing, and constructing stations. Stage developed is discussed in more detail in the Station Spacing and Siting Guidelines.

Capacity standards for sizing facilities are discussed in Section 6 of the *CCLRT Design Criteria* (available from Metro Transit on request). This section states facilities should be sized to meet level of service C or better capacity standards projected for peak 15-minute intervals in the year of opening, gives recommended circulation system dimensions, and notes that "pedestrian paths, plazas, ramps, and queuing areas shall be sized in accordance with the level-of-service capacity standards contained in <u>Pedestrian Planning and Design</u> by J. Fruin . . . site elements such as fare vending machines . . . shall be located and sized so that queues or areas of congregation do not block pedestrian flow."

4.10.5. Transitway Station Design and Components

Transit stations should be designed consistent with accepted architectural and site design standards. Standard components to be included at every transitway station include:

- *Lighting*
- *Heating*
- *Security features*
- *Blast-resistant litter receptacles*
- *Ticket vending machines or comparable technology should be provided at all rail stations, and all BRT stations should be constructed to support the inclusion of ticket vending machines.*

Materials used in transitway stations should be attractive, sustainable, and cost-effective for the life of the investment. Cost considerations should include both the capital investment and life-cycle costs. All materials should be low-maintenance, easy to repair and replace, difficult to remove, deface, or damage, and environmentally friendly.

Transit stations generally should not include public restrooms unless the station is part of a larger, multi-use building or a major transfer point requiring routine daytime wait times of one hour or more. Where public restrooms are provided, stations should be staffed for security and maintenance.

Other amenities, which may or may not be appropriate to provide, include:

- *Seating*
- *Concessions and newspaper vending*
- *Acoustic treatments*

Additional information on transitway station design and amenities is included in the Stations and Support Facilities Technical User's Guide (available upon request).

Transitway station design and material selection need to consider on-going maintenance needs such as the ability to accommodate snow removal equipment and snow storage requirements. The provision of snow removal, litter removal, cleaning, and maintenance should be incorporated into planning and budgeting at early stages with agency roles and responsibilities clearly defined in interagency agreements to avoid complications once operational.

A number of accepted policies exist for use in station design including, but not limited to:

- Americans with Disabilities Act (ADA)
- National Environmental Protection Act (NEPA)
- Title VI of the Civil Rights Act of 1964
- FRA, FTA and AREMA regulations

- State and local regulations and guidance including the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD)
- Metropolitan Council's *2030 Park-and-ride Plan*

Access to restrooms should be provided for transit operators at stations which function as layover facilities and at terminal stations. Where stations are located within a multi-use building or qualify as an assembly area according to the State Building Code, public restrooms may be provided. Evaluation criteria include the number of passengers and routine wait times of one hour or more. Public restrooms may be considered as a local betterment at any transit station.

4.10.6. Landscaping, Streetscaping, and Public Art

Landscaping (plant materials), streetscaping (hardscape), and/or public art should be provided at transitway stations to create quality public spaces that are attractive for transit patrons and complement the surrounding area. In addition to meeting the guideline regarding station design and components, landscaping, streetscaping and public art design should:

- *Provide clear sight lines which do not impede visibility for waiting transit passengers, transit vehicles in the runningway, or other transportation modes intersecting the transit runningway*
- *Avoid creating areas of concealment*
- *Avoid interference with pedestrians, bicycle, bus, and auto paths – this should include integrating all public art into functional station elements to avoid creating unanticipated physical obstacles in station areas*

Consistent with FHWA guidelines, the cost of landscaping and streetscaping should be no more than five percent of the above-ground construction cost (i.e., the percentage should not be associated with the cost of underground utility relocation). Consistent with FTA guidelines, the cost of public art included at stations and in all other areas of a project should be within one-half percent to five percent of the project construction budget, depending on the funding source, with larger percentages typically associated with lower cost projects.

Additional information on transitway station landscaping, streetscaping, and public art is included in the Stations and Support Facilities Technical User's Guide (available upon request).

Streetscaping (hardscape) and/or public art is an acceptable alternative to landscaping (plant materials) in many circumstances. It is best to integrate all landscaping, streetscaping, and public art into the functional elements of the station where possible. The station railing at the 50th Street LRT station on the Hiawatha line is an example of effective public art as an integral station element. Landscaping that assists in passive cooling or wind blockage is another example.

Where plant materials are used, those appropriate to Minnesota climate and soil conditions, including tolerance to sand/salt used to clear paths during winter, are preferred. Plantings that require no additional irrigation other than rainfall once the material is well-established are also preferred. Short- and long-term irrigation needs for all natural plant materials should be considered; irrigation, an alternate engineered irrigation system, or an interagency agreement regarding watering is required where irrigation is essential to the life of the plants.

The region currently spends between one-half and one percent of a station's cost on public art. Funds spent on landscaping, streetscaping, and/or public art should be appropriate to the overall costs of the transit project and adequate to meaningfully benefit the station area. Above the stipulated level provided in the project funding agreements, additional landscaping, streetscaping and/or public art will likely be considered a local betterment.

4.10.7. Transitway Passenger Information

One of the primary functions of transitway stations is the provision of transit information in and around stations. Transit information and wayfinding information within and to transitway stations should be provided at all transitway stations. Signage should seamlessly guide passengers to and through the station and its functions, including passengers who are not familiar with the transit system, with disabilities, who are non-English speakers, and/or who are non-readers. Wayfinding information to major, permanent civic attractions should also be provided at all transitway stations.

Transitway station signage should incorporate the transitway branding scheme (see the Identity and Branding Guidelines). Placement and general content of information should be consistent within station areas whenever possible.

Real-time schedule information should be provided at high-volume stations whenever site conditions allow.

Transit information elements include weatherproof transitway route maps, schedule information, and rider alerts for all transit routes serving the station. Types of signage include static, variable, or real-time.

Station areas should include wayfinding information within the station area to platform entrances and exits, bicycle parking areas, bus drop off, short-term pick-up/drop- off, and, where provided, park-and-ride facilities. Station areas may also include wayfinding signs directing passengers to nearby public facilities that are major, permanent civic attractions in proximity to the station. Examples include City Hall, the State Capitol, museums, and other nearby transit facilities. Where budget permits, wayfinding signs may also include other major civic attractions such as nearby parks, recreational trails, stadiums, and public event centers close to the station. Wayfinding within the station area to businesses or other types of attractions nearby may be included as a local betterment.

4.10.8. Pedestrian and Bicycle Access

Special attention should be given to providing convenient and safe bicycle and pedestrian access to and through transitway stations including improved bicycle and pedestrian facilities and roadway modifications where appropriate. Pedestrian and bicycle paths should be designed to provide the most direct route, paved, clearly marked, lighted, and buffered to improve bicycle and pedestrian experiences and discourage people from crossing tracks or roadways in other than designated areas. Mid-block crossings between stations and street intersections should be avoided. At-grade crossing should be utilized where feasible.

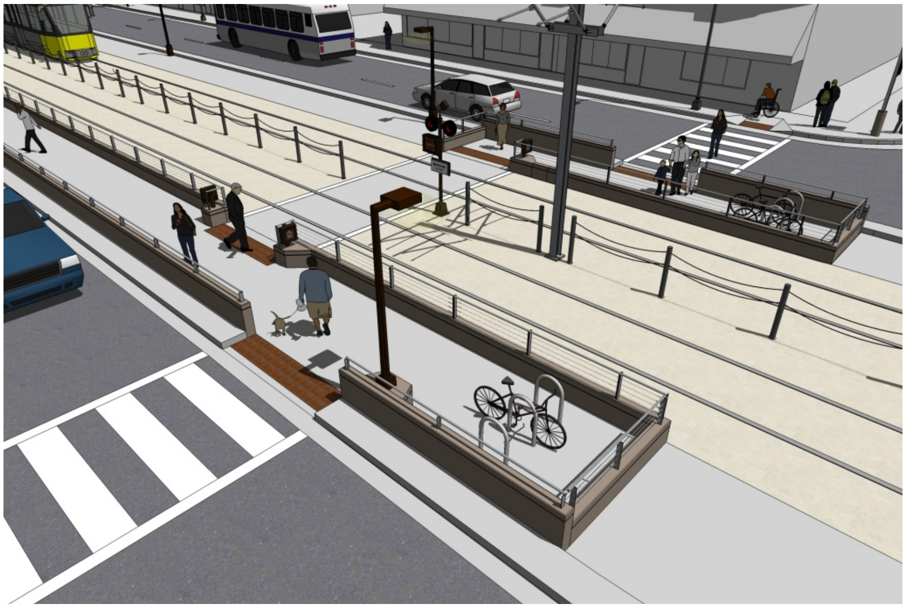
Grade-separated bicycle/pedestrian crossings may be considered where there is no technically feasible at-grade crossing option, the benefits to the broader transportation system are shown to be significant, or the grade-separation is required by the runningway's owning entity (e.g., railroad). Evaluation criteria should include:

- *High pedestrian volumes*
- *Long pedestrian crossing distances*
- *Presence of poor sight distance to see crossing transit patrons*
- *Roadway average daily traffic volumes of more than 35,000 and 80th percentile speeds documented at more than 40 mph*
- *Distance of greater than 600 feet to the nearest alternative safe crossing (i.e., controlled intersection or existing under-/over-pass)*
- *Potential to coordinate with adjacent facilities such as a bike trail or sidewalk system*

Additional information on pedestrian and bicycle access, including grade-separated crossings, is included in the Stations and Support Facilities Technical User's Guide (available upon request).

Improved bicycle and pedestrian facilities include features such as more visible crossings using pavement treatments, colors, or markings; pedestrian refuge medians; roadway curb extensions; intersection countdown timers; or passive crossing control (e.g., "z-type" crossings on University Avenue as illustrated in Figure 4-2). Roadway modifications include features such as adjusted intersection traffic signal timings to accommodate bicycles/pedestrians; additional traffic signals; elimination of conflicting turn movements such as free-right turn movements; and intersection modifications to provide more convenient and safer bicycle and/or pedestrian crossings.

Figure 4-2 "Z-type" Pedestrian Crossing at Unsignalized Intersection



Source: CCLRT Project Office

Pedestrian/bicycle overpasses/underpasses will typically be open during transitway service hours only unless the overpass/underpass is part of a multiuse facility (e.g., trail, sidewalk system, or building). Special conditions will apply when an overpass/underpass connects to a building as buildings may be locked during non-business hours, which may restrict the availability of any overpass/underpass for transit patrons. Overpass/underpass hours of availability should be considered early in the transitway design process.

Overpasses should be constructed with protective guardrails and fencing. In determining whether an overpass should be covered or enclosed, factors to consider include the following:

- Volume of pedestrian and bicycle transit patron usage
- Snow removal requirements and constraints (e.g., requirements to carry snow off an overpass rather than plow it off)
- Length and climate conditions of the facility to be overpassed (e.g., wind shear over a river or freeway)

Per Guideline 4.10.3, enclosed overpasses should be vented but not heated or cooled. Overpasses and underpasses should include lighting that achieves required illumination levels for the safety and comfort of station users.

If an at-grade crossing is feasible or where functional and maintenance needs do not indicate a cover or enclosure is necessary, provision of a grade-separated bicycle/pedestrian crossing or enhancement with a cover or enclosure may be a local betterment.

4.10.9. Transitway Station Safety and Security

Transitway stations should be designed to promote a safe, secure, and comfortable environment for patrons. The design process should include:

- *Consideration of the application of the principles of crime prevention through environmental design*
- *Conducting a Design Review and Hazard, Threat, and Vulnerability Analysis*
- *Provision of surveillance and communications equipment for both deterrence and emergency response*

The lead agency should also coordinate transitway emergency response planning, including maintenance of access to transitway stations.

More information on the design and function of safety and security elements is included in the Stations and Support Facilities Technical User's Guide (available upon request).

Important elements of safety for consideration at stations include:

- The use of slip-resistant materials at stations to account for rainy or snowy conditions
- The use of tactile warning strips along the platform's boarding edge

The principles of crime prevention through environmental design include natural surveillance (transparent design, lighting and location near positive activities), natural access control (design of entry points and flow), natural territorial reinforcement (site and landscape design), and maintenance.

During the station design process, an evaluation should be conducted to identify any elements which might inadvertently compromise the overall safety and security of the station area. Consistent with the requirements of both FTA and FRA, the evaluation should be completed by the transit operator and should include a detailed risk assessment to pinpoint the possibility of hazards and potential areas of vulnerability within the station. The methodology should identify potential hazards related to persons (employees, passengers, pedestrians, and members of the general public), trains, buses, equipment, autos, and first responder vehicles which may use a station.

Station surveillance and communications equipment should include public address systems, closed circuit television, and emergency telephones. Public address systems include both speakers and signs able to convey information to persons with disabilities in compliance with ADA requirements. Closed circuit television cameras should record activity on platforms and at any ticket vending machines. Emergency telephones should be provided on or near platforms and near elevators on every level of structured parking for communication with the central operations center and emergency services. Public telephones should not be provided at stations.

Lead agency emergency response coordination should be established and maintained via a documented plan developed with the concurrence of all agencies with jurisdiction over facilities adjacent to or connecting with transitway stations.

4.10.10. Transitway Support Facilities

The need for transitway support facilities should be identified during transitway planning and design to ensure that adequate facilities are provided for these functions. Transitway support facilities should address daily vehicle storage and cleaning, major vehicle maintenance, central system control, and/or runningway maintenance. Exterior materials should be selected based on attractiveness, durability, and low-maintenance needs, with interior material selection focusing primarily on durability and low-maintenance needs. Acoustics should be carefully considered and designed to ensure the facility is buffered from surrounding, non-industrial land uses including residential and commercial areas.

The size and functions of transitway support facilities will be determined by the specific program identified for each support facility.

Other elements of transitway runningways, including power substations and traffic signals, are discussed in the Runningways Guidelines.

4.10.11. Local Betterments

Transitway station and support facility enhancements beyond the base elements described above will likely be considered local betterments that require a local commitment of funding for capital, operations, and maintenance. Local betterments may be included in the transitway project when the enhancement is consistent with and complements the station or support facility's community context, adds to passenger comfort and/or interest, and funding of its added capital, construction/installation, operation, maintenance, repair, and refurbishment/replacement has been negotiated and implemented through an interagency agreement.

Local betterments are any improvements to typical transitway designs that a local community desires which add capital, operating, and/or maintenance cost. Examples of local betterments may include public restrooms at stations and park-and-rides; enhanced landscaping, streetscape, or public art; enhanced wayfinding to business or other attractions outside the station area, grade-separated bicycle/pedestrian crossings where an at-grade crossing is feasible, or enhanced components, materials, and/or finishes at stations.

The desire for these kinds of improvements, whether requested by local communities or required by local zoning and design requirements, should be acknowledged by the lead organization and reflected early in the station design process. Early coordination should include a local commitment to fund the added cost of design, construction, ongoing maintenance and repair, and periodic refurbishment and/or replacement of the betterment. Cost participation for betterments should be negotiated during the design process and implemented through interagency agreement.

5. RUNNINGWAYS

5.1. INTRODUCTION

5.1.1. Chapter Introduction

This document provides the technical basis and rationale for the Regional Transitway Guidelines for transitway runningways through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the remainder of this chapter is organized by the following modes:

- Light-Rail Transit (LRT)
- Commuter Rail
- Highway Bus-Rapid Transit (Highway BRT) – including station-to-station and express service
- Arterial Bus-Rapid Transit (Arterial BRT)
- Runningway Guidelines

Each modal section includes:

- Relevant background information including applicable laws and regional policies
- Technical basis by mode supporting the recommended guidelines, including variance from existing guidance where suggested

5.1.2. Committee Purpose

The purpose of the Runningways Technical Committee was to draft guidelines for use when planning and designing transitway runningways. The guidelines are meant to help define and describe the types of transitway runningways currently operating or under development in the region. The guidelines are also meant to help identify key issues to be addressed when planning and designing a runningway. These guidelines will promote a transitway's ability to provide competitive, reliable travel times while meeting or complementing transportation needs identified in a corridor.

5.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the Runningways Technical Committee discussions include Arterial BRT, Highway BRT station-to-station, Highway BRT express, LRT, and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and high quality of transit facilities.

5.2. BACKGROUND INFORMATION

5.2.1. Definitions

The following section defines terms applicable to the Runningways Guidelines.

Runningway - The linear component of the transit system that forms the right-of-way reserved for the horizontal and vertical clearance requirements of transitway vehicles and ancillary structures or equipment required to operate LRT or Commuter Rail trains or BRT buses (sometimes called guideway). While the runningway incorporates the space needed to operate transit, it should be differentiated from right-of-way, which incorporates the potentially larger area needed to implement the project. For example, right-of-way would include additional property that may need to be acquired to relocate facilities that are adjacent to the runningway and need to be moved, such as sidewalks, driveways, light poles, landscaping, etc.

In general, the runningways for each mode can be characterized as:

- LRT: Dedicated right-of-way containing rail trackage designed for LRT vehicles. Twin Cities LRT runningways typically hold two tracks, and typically are not shared with other transportation modes except at-grade crossings. LRT runningways can be either paved or unpaved (constructed with ballasted track). LRT runningways include ancillary facilities within the runningway right-of-way such as traction power substations.
- Commuter Rail: Dedicated right-of-way containing railroad trackage designed for freight and passenger railroad rolling stock. Commuter Rail runningways can hold one or more tracks, and are frequently jointly used by both Federal Railroad Administration (FRA)-compliant passenger transit and freight rail vehicles. Commuter Rail runningways are constructed with ballasted track except at-grade crossings.
- Highway BRT: Highway, freeway, or paved bus-shoulder lanes within a limited access or other multi-lane highway designed for posted speeds of 45 miles per hour or higher. Highway BRT runningways may be dedicated to bus transit, shared with other high occupancy vehicles, shared with general traffic turning movements and incident management/emergency use, or incorporated into priced facilities. Highway BRT runningways may be barrier separated or indicated by surface striping, markings, color, and/or signage. Highway BRT runningways can be positioned as median, curb, or “dynamic” shoulder lanes.
- Arterial BRT: Roadway lanes, typically within a minor arterial or collector roadway designed for posted speeds of less than 45 miles per hour, where transit travel-time advantages are provided under congested roadway conditions. Arterial BRT lanes can use time-of-day lane controls to provide dedicated right-of-way for buses. Arterial BRT runningways can be positioned as median or curb lanes, and are typically not barrier separated from general traffic lanes. Arterial BRT can operate in dedicated lanes, shared-use lanes, managed lanes, or in general purpose mixed traffic lanes with operational advantages.

5.2.2. Existing Laws and Regulations

The following section summarizes the existing laws and requirements that are relevant to the Runningways Guidelines.

5.2.2.1. *Assembly and Ownership of Corridor Runningway*

Property acquisition and remnant parcel resale or reuse - Where it is determined that property should be acquired for a transit runningway, and that such acquisition is feasible and cost-effective, such acquisition should follow all applicable local, state, and federal regulations, including National Environmental Policy Act (NEPA) requirements for environmental clearance before property acquisition.

Where remnant parcels are documented as unneeded, resale procedures should follow local, state and federal regulations and procedures.

Right-of-way ownership - Under all four modes, stations are owned by the transit operator. Stations are addressed in the Stations and Support Facilities chapter.

Light-rail transit: LRT runningways may be constructed within public streets or within private right-of-way. Whether within public or private right-of-way, the Metropolitan Council/Metro Transit is the owner of runningway facilities such as tracks, intersection protection equipment, catenary, etc. The Metropolitan Council, as owner-operator, may bid equipment such as safety equipment out to another operator.

Within public right-of-way, ownership of the right-of-way within which the LRT tracks lie, such as University Avenue or the Southwest LRT Corridor, should be retained by the owning entity.

Within private right-of-way such as a railroad, ownership must be controlled by the Metropolitan Council through a permanent easement or other legal agreement with the right-of-way owner. Where right-of-way must remain under the ownership of a private entity, negotiated operating rights identify the Council's rights and obligations.

Commuter Rail: Commuter Rail runningways may be constructed within public or private right-of-way. As with all Commuter Rail implementation within a railroad-owned right-of-way, the issue of ownership and maintenance responsibility of infrastructure improvements should be negotiated with the railroad. Generally, improvements within the right-of-way which only benefit the Commuter Rail provider (station platforms, etc.) will be owned by the Commuter Rail provider and maintenance will be the responsibility of the Commuter Rail provider. Improvements within the right-of-way which benefit both parties will be owned and maintained by the railroad. The physical maintenance of infrastructure within the right-of-way (with exception of passenger platforms) will typically be performed by the railroad regardless of who is responsible for the cost of maintaining said infrastructure. As example, the switch the passenger trains use to enter the station tracks at Target Field is owned by the Council but is maintained by the railroad at the Council's expense but other switches installed on the corridor as a result of Northstar that are used by both parties are owned and maintained by the railroad.

Where Commuter Rail operates on railroad-owned trackage and operates via permanent easement or negotiated agreement with the track owner, the railroad remains the owning entity. A permanent easement or negotiated operating rights identify the Council's rights and obligations. Where Commuter Rail operates on separate, non-railroad-owned trackage, the Metropolitan Council is the owner of that trackage. As an example, the Metropolitan Council is the owner of runningway facilities such as the tracks and switches at the Big Lake maintenance facility on the Northstar Line.

Highway BRT: Ownership of the right-of-way within which Highway BRT operates, excluding any BRT facilities such as stations and vehicles, should be retained by the roadway-owning entity, which may be the Minnesota Department of Transportation (Mn/DOT), county, or city. The Metropolitan Council/Metro Transit is the owner of runningway facilities such as intersection protection equipment. The Metropolitan Council, as owner-operator, may bid such equipment out to another operator.

Arterial BRT: Ownership of the right-of-way within which Arterial BRT operates, excluding any BRT facilities such as stations and vehicles should be retained by the roadway-owning entity.

Utility considerations - Procedures and criteria governing design for the provision, consolidation, relocation, adjustment, protection, or other work related to existing public and private utilities necessary to accommodate transit runningways are given in the *Central Corridor LRT Report for Design Criteria (CCLRT Design Criteria), Northstar Corridor Rail Project Design Criteria (Northstar Design Criteria)* (both available from Metro Transit on request), and/or state and local roadway design documents.

In addition, consideration should be given to utilities that share the runningway space. Runningway designers should work with utility owners to locate and design underlying utilities to withstand the impacts of the transit runningway and minimize the need for disruption due to routine or emergency maintenance.

Agreements that will be needed to cover the cost of utility relocation/protection should be identified during the NEPA/preliminary engineering process.

In addition to following available guidance, the transit operating agency should pursue partnerships with local utilities to pursue the following:

- Assess opportunities to reduce the total carbon footprint of the system
- Demonstrate environmental stewardship
- Partner on projects that result in utility investment in alternative technologies that reduce overall system consumption
- Seek opportunities to consume and store energy during off-peak periods
- Optimize public investment in shared infrastructure

5.3. LIGHT-RAIL TRANSIT

5.3.1. Fundamental Laws and Underpinning Planning Requirements

A number of national, state, and local regulations, standards and practices presently shape LRT runningway design. These include, but are not limited to, those listed below.

5.3.1.1. ***Laws and Regulations***

United States Department of Transportation (US DOT) Final Rule, Transportation for Individuals with Disabilities

- Americans with Disabilities Act (ADA)
- Federal Railroad Administration (FRA)/Federal Transit Administration (FTA) Joint Policy on Shared Corridors
- Title VI of the Civil Rights Act of 1964
- National Environmental Policy Act (NEPA)
- Minnesota Environmental Policy Act (MEPA)

5.3.1.2. ***National/State Design Standards***

- Relevant American Railway Engineering and Maintenance of Way Association (AREMA) standards and recommended practices
- Relevant American Public Transportation Association (APTA) standards and recommended practices
- Relevant American Association of State Highway and Transportation Officials (AASHTO) standards and recommended practices

- Relevant National Fire Protection Association (NFPA) standards and recommended practices
- *Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways* (MnMUTCD)
- *Minnesota Department of Transportation (Mn/DOT) Road Design Manual*
- Minnesota Department of Transportation (Mn/DOT) State Aid guidance

5.3.1.3. ***Local Design Guidance***

CCLRT Design Criteria, July 2008

For most issues, LRT design guidance is provided in the *CCLRT Design Criteria*, July 2008 and as updated (available from Metro Transit on request). That document built on lessons learned from the Hiawatha LRT project. It documents basic design criteria to be used in the design of the Central Corridor LRT system, and forms the basis for subsequent LRT corridor design in the Twin Cities. Where LRT operates in a public street or shares right-of-way with buses, the design requirements and concepts of Mn/DOT, AASHTO, county and local municipalities should also be utilized.

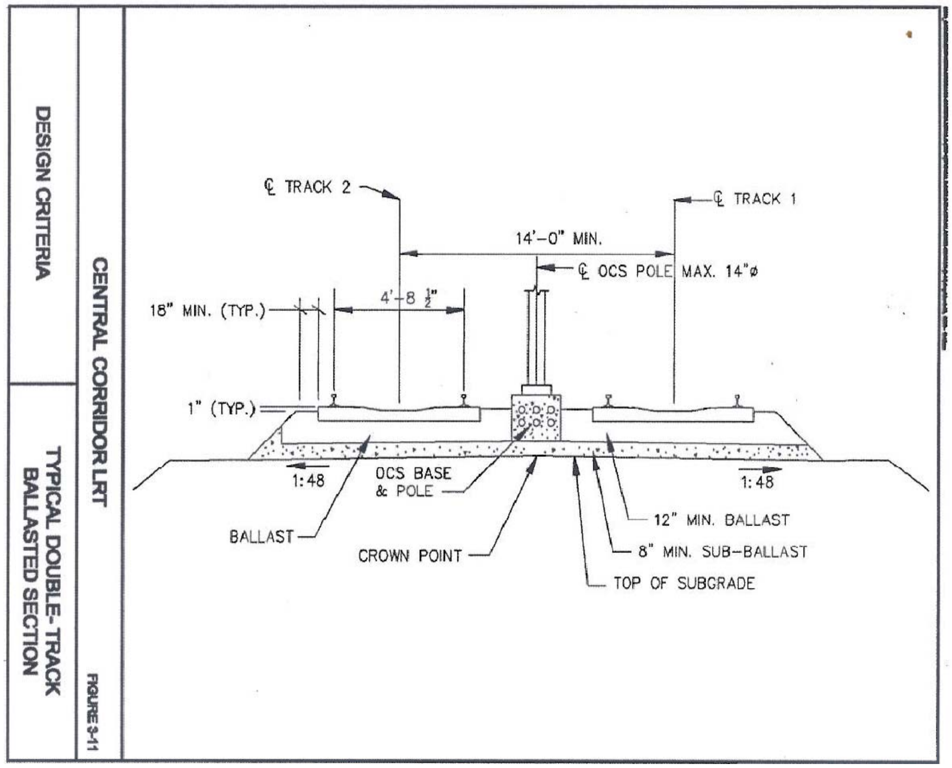
The *CCLRT Design Criteria* directs optimizing LRT design including considerations for elements such as:

- Cost for design, construction, capital facilities
- Operating expense
- Energy consumption
- Minimizing disruption to local facilities and communities
- Meeting aesthetics, community, and local agency standards.

The CCLRT report also directs that design be consistent with passenger safety, system reliability, service comfort, mode of operation, type of light-rail vehicle to be used, and maintenance considerations.

Vehicle clearance envelopes that dictate horizontal and vertical requirements for LRT runningways are provided in the appendices of the Report. Figure 5-1 illustrates a typical Twin Cities LRT cross section (source: *CCLRT Design Criteria:* Fig 3-11 - Typical Double-Track Ballasted Section*)*. Clearance requirements are dependent on several factors, including vehicle requirements, curvature, grade, and other factors.

Figure 5-1 - Typical Cross Section for LRT Runningway



Modifications may be made due to local conditions subject to FTA and local jurisdiction approval. Twin Cities alternates to the APTA or AREMA standards should be based on a safe operating history, described and documented in the system's safety program plan (or another document that is referenced in the system safety program plan). Documentation of alternate practices should:

- Identify the specific rail transit safety standard requirements that cannot be met
- State why each of these requirements cannot be met
- Describe the alternate methods used
- Describe and substantiate how the alternate methods do not compromise safety and provide a level of safety equivalent to the practices in the APTA safety standard

Guidance from Local Jurisdictions

Local jurisdictions may also have design guidance and/or local policies relevant to integrating municipal facilities when transit runningways traverse or cross city streets, sidewalks and bikeways. Current municipal guidance includes:

- *St. Paul Central Corridor Bicycle and Pedestrian Plan* (http://stpaul.gov/index.asp)
- *Access Minneapolis*, Street and Sidewalk Design Guidelines (http://www.ci.minneapolis.mn.us/publicworks/trans-plan/DesignGuidelines.asp)
- *Minneapolis Downtown Action Plan*

- *Minneapolis Pedestrian Master Plan*
- *Minneapolis Bicycle Master Plan* and *Bicycle Design Guidelines*

The section on transit facilities in the *Access Minneapolis*, Design Guidelines for Streets and Sidewalks, Pedestrian Facility Design, October 26, 2009 provides s a good example of local guidance.

5.3.2. Physical Characteristics of LRT Runningways

5.3.2.1. ***Number/Direction of Tracks***

LRT runningways should be designed to provide a double-track, system that provides for trains running in both directions through the length of the corridor. The two tracks may be adjacent to each other, or may be separated by other traffic lanes within the same roadway. For traffic operations and rail maintenance, it is preferred to have tracks directly adjacent to and not separated by roadway lanes.

Where short-term train storage is desirable and space is available at stations, pocket track segments should be constructed. These tracks should be connected to the running tracks via crossovers. Multiple tracks at operating and maintenance facilities should also be provided to facilitate expeditious access to, through and from maintenance facilities, yards and shops.

5.3.2.2. ***Runningway Width***

LRT runningway widths should be sufficient to accommodate required horizontal clearance for trackage and ancillary facilities. Horizontal clearance requirements are described in the *CCLRT Design Criteria*.

5.3.2.3. ***Pavement Type***

The *CCLRT Design Criteria* addresses the three distinct types of track construction: ballasted, embedded, and direct fixation, and conditions indicating where each type is appropriate. Ballasted track, while requiring an additional average of two feet of right-of-way width, is significantly less costly than the other options, and therefore the preferred pavement type, with the following exceptions.

Where LRT is constructed within an existing roadway, such as Central Corridor LRT in University Avenue or downtown streets, embedded track is preferred. Factors to consider include community context (e.g., land uses, density, and proximity to runningway), left-turn driveway access, available right-of-way, and potential hazards of loose rock in the roadway.

- Where LRT intersects or adjoins paved streets, sidewalks and bikeways, such as Hiawatha LRT intersections with 46th and other streets in south Minneapolis, embedded track is required.
- For tunnels and bridges such as the Hiawatha Lake Street and Crosstown Highway LRT bridges, direct fixation track is preferred.

Grass or other vegetation is not an acceptable runningway paving treatment.

Where a bikeway or recreational trail is parallel to the transit runningway, ballasted track should be maintained to provide clear delineation between the runningway and the trail.

Where a paved bikeway, pedestrian sidewalk, or recreational trail is parallel to a transit runningway with paved track, that facility should be clearly separated and so marked from the runningway.

5.3.2.4. ***Pavement Depth***

Where LRT runningways contain paved track, pavement depth for embedded or direct fixation track is described in the *CCLRT Design Criteria*.

5.3.2.5. *At Grade/Grade Separated*

LRT runningways should be at grade to minimize cost. Grade separation will be considered where dictated by transitway and adjacent systems operating conditions, topographic conditions, or crossing major facilities such as freeways or bodies of water.

Where grade separations are required, clearance requirements and all design considerations are as described in the *CCLRT Design Criteria*. Where LRT runningways are proposed on pre-existing structures not owned by the Metropolitan Council or Metro Transit, such structures should be evaluated or modified to accept intended loads. Any evaluation or modification is subject to review and approval by the owning entity.

5.3.2.6. *Runningway Placement/Direction relative to Other Transportation Rights-of-Way*

Design criteria for rail clearances are complex and based on numerous assumptions and interfaces. LRT runningway designers should consult the *CCLRT Design Criteria* for specific standards relative to the placement of LRT runningways, which are generalized below.

Roads - LRT runningways may be adjacent to, within medians of, or separated from roadway lanes. Median lane implementation is preferred because of traffic operational challenges associated with side running LRT – a significant lesson learned from early Hiawatha LRT operation.

Runningways should be positioned to minimize conflict with traffic flow and property access. LRT in runningways adjacent to traffic lanes may run in the same direction as traffic (concurrent flow), or in the opposite direction (contra-flow). As an example, LRT on 5th Street in downtown Minneapolis operates in both directions on a one-way street. Fifth Street is one-way northbound, and Hiawatha LRT trains run both with traffic flow when northbound, and contra-flow when southbound.

Where roadways and/or property access driveways operate adjacent to LRT runningways, LRT runningways should be separated from those facilities as specified in the *CCLRT Design Criteria* addressing clearances, and the type, size, and location of fencing or barriers following AASHTO, Mn/DOT, and/or local agency guidelines.

Rail – LRT runningways may be within or adjacent to railroad right-of-way. When within a freight railroad runningway, the private railroad will stipulate required clearance and barrier type. Typically 25- to 50-foot minimum from center line of both freight and LRT trackage is required *(*source: BNSF Railway – Union Pacific Railroad Guidelines for Railroad Grade Separation Projects, and Resor, Catalog of "Common Use" Rail Corridors, sponsored by US DOT, FRA*).* A crash barrier or fence may also be required.

Adjacent to freight railroad right-of-way, recommended minimum LRT clearance is 15-feet from center line of closest LRT track to the edge of the railroad right-of-way. The 15' allows for a safety walkway between the track and the fence. If a full ballast section with a drainage ditch is used, 25' is needed. *(*source: CH2M Hill rail engineering staff*).* A fence would be located on the right-of-way line.

Pedestrian/Bicycle Path – For pedestrian and bicycle paths adjacent to LRT runningway, 15-feet from center line of outside track to edge of pedestrian/bike right-of-way is recommended. Fencing is preferred.

5.3.2.7. *Interlock/Crossover/Special Requirements/Reverse Direction Running*

Railway signaling application within runningways should be as specified in the *CCLRT Design Criteria*, to enhance safety in the movement of trains and to improve the overall efficiency of train operations.

5.3.2.8. *Time-of-Day Runningway Controls*

Twin Cities LRT runningways should be developed for the dedicated use of LRT. Time-of-day runningway controls, also called temporal separation, to permit other vehicles within the runningway should be permitted only in exceptional circumstances. Where LRT is proposed to operate with temporal separation on track shared with railroads under the jurisdiction of FRA, FRA has jurisdiction and must approve along with FTA, affected jurisdictions, and the transit operator.

5.3.2.9. *Traffic Signal Type and Interaction*

Traffic signal interaction should be coordinated during the design phase with the jurisdictional authority, to give transit every feasible travel advantage while maintaining reasonable traffic operations. Examples of traffic strategies to be considered include signal priority, which provides the most flexibility to manage all modes of transportation.

Roadway traffic signals at locations that interface with LRT runningways should have backup power in coordination with the entity having jurisdiction over the specific traffic control system.

5.3.2.10. *Backup Power for Corridor Runningway Systems*

Runningway designers should address the spacing of substations, as backup runningway traction power is to be provided by adjacent substations. Redundancy should be limited to the backup power each substation provides to the substation on both sides.

Backup power separate from substations should be extended to train control, safety, and security systems.

Backup power for tunnel lighting should be from a separate source so that loss of power from one source does not remove power from tunnel lighting.

Backup power for station elements is addressed separately in the Stations and Support Facilities guidelines.

In coordination with the jurisdiction with authority over an adjacent or intersecting roadway's traffic control system, a backup power supply for traffic control should be provided, with the capacity to operate the warning system for a reasonable length of time during a period of primary power interruption.

5.3.2.11. *Lighting*

Runningway lighting should be provided to ensure safe operation and personal security and should be consistent with ADA and AASHTO requirements. Selection and design of fixtures and levels should be reflective of context, and comply with the goals, objectives, and provisions of the *CCLRT Design Criteria.* While the Central Corridor LRT traverses a fully urbanized area, the goals and objectives established in that document are appropriate to runningway corridor lighting throughout the Twin Cities region. Coordination with the local jurisdiction and adjacent property owners where LRT runningways intersect with residential and commercial land uses should be pursued to develop appropriate levels, heights, and shielding techniques.

5.3.2.12. *Barrier Types*

Current LRT design standards stipulate discouraging or prohibiting guideway crossings other than at marked, controlled crossings. Lane striping, pavement color, pavement texture, and/or barriers may be appropriate to guide, discourage, or prevent access to runningways in areas not designated as a legal crossing. Techniques include "z- crossings", mountable curbs separating LRT from street traffic lanes, bollards and other concrete barriers, and fencing.

Access to LRT runningways should be as appropriate to provide security and/or enhance safety, as specified in the *CCLRT Design Criteria*. Type, size, and location of fencing or barriers should be determined by site-specific conditions and requirements, following AASHTO, Mn/DOT, AREMA and/or local agency guidelines.

5.3.2.13. *Landscaping*

Runningway landscaping should be coordinated with the local jurisdiction to comply with its requirements as well as with the goals, objectives, and provisions of the *CCLRT Design Criteria*. While the Central Corridor traverses a fully urbanized area, the goals and objectives established in that document are appropriate to runningway corridor landscaping throughout the Twin Cities region.

Any landscaping, including noise walls, should be designed and provided to maintain sight lines for all transportation modes at at-grade crossings.

5.3.2.14. *Signage*

Signs and graphics should comply with the goals, objectives and provisions of the *CCLRT Design Criteria* and local jurisdictional requirements. Wayfinding signage is addressed in the Stations and Support Facilities chapter.

5.3.2.15. *Noise/Vibration Considerations*

The potential for noise and vibration during construction and operation should be considered both during the planning of alignments and when identifying technology, components and materials. Where mitigation measures are determined to be necessary, technology, components, and materials should be considered as potential strategies.

5.3.3. Addressing Operations of LRT Runningways in Design

Elements of LRT operation which should be addressed during design are noted below.

5.3.3.1. *Communications and Central Control*

Infrastructure for communications to facilitate control and monitoring of train traffic, infrastructure conditions and facilities should be incorporated into runningway design, consistent with the facilities and provisions of the *CCLRT Design Criteria*.

5.3.3.2. *System Compatibility*

LRT runningways should be designed to be compatible with all existing and planned Twin Cities LRT corridor services. In the event that additional types of rolling stock should be added to the Twin Cities light-rail vehicle (LRV) fleet, the horizontal and vertical clearance requirements of those vehicles should be accommodated within the runningways where such vehicles are planned to operate.

5.3.3.3. *Contingency Planning*

Runningway design should consider operational breakdown situations, which may include power outages, storm damage, stalled vehicles within the runningway, crashes, and other unforeseen circumstances. While a contingency plan would be a system operating element, runningway designers should be cognizant of potential needs for access to accommodate:

- Bus boarding and alighting access points of sufficient size to accomplish bus bridges

- Emergency service by first responders.

5.3.4. Addressing Maintenance of LRT Runningways in Design

Elements of LRT maintenance which should be addressed during design are noted below.

5.3.4.1. *Impact on Design Features*

Consistent with best industry practices and the *CCLRT Design Criteria*, LRT runningway infrastructure should be designed and constructed of materials which optimize efficient and cost-effective maintenance of the runningway and the life of the facility.

Capital costs must be based on life-cycle costs, which reflect the true cost over time of design elements. Life-cycle costing also follows recommended practices such as those recommended by APTA's Transit Sustainability Practice Compendium.

5.3.4.2. *Snow Removal*

Runningway design should reflect Twin Cities' winter operational procedures, and accommodate the equipment necessary to allow the LRT service to operate as planned during snow events. The transit operating agency should seek to efficiently coordinate snow removal provisions with affected jurisdictions responsible for snow removal from adjacent roadway, bicycle, and pedestrian facilities.

5.3.4.3. *Repairs and Refurbishments/Upkeep*

Consistent with best industry practices and Twin Cities operations, runningway design should stipulate cost-effective materials and facilitate cost-effective methods of repair and refurbishment. Runningway design should consider access and space needs for the safe inspection and maintenance of runningways.

5.3.4.4. *Operating/Maintenance Responsibility*

Responsibility for the operation and maintenance of LRT runningways should rest with the LRT operating entity (Metropolitan Council/Metro Transit). Wherever possible, the use of existing infrastructure and facilities should be maximized when choosing transit alignments. Maintenance of infrastructure under the jurisdiction of others, such as street/bicycle/pedestrian crossings, should be coordinated with the appropriate jurisdiction.

5.3.5. Addressing Safety and Security of LRT Runningways in Design

The Twin Cities LRT operator should prepare, implement, and annually update a safety and security plan. The Fire/Life Safety provisions in the *CCLRT Design Criteria* should be followed.

5.3.5.1. *Design Review for Safety and Security*

An evaluation of each LRT runningway type should be made using a documented methodology such as that recommended by APTA. Examples of specific design-related elements of runningways to be evaluated include:

- Improved sight distance
- Raised median or divider
- Signage
- Pavement markings
- Curbs

- Roadway surface
- Highway realignment
- Improved cross-section
- Illumination of the crossing
- Crossing surfaces
- Pedestrian and bicyclist access and crossings

5.3.5.2. *Hazard, Threat and Vulnerability Analyses*

Early in the design phase, the transit operating agency should conduct a detailed risk assessment to pinpoint the possibility of hazards and potential areas of vulnerability within the runningway. The methodology should identify potential hazards related to persons (employees, passengers, pedestrians, and members of the general public), trains, equipment, highway vehicles, and other property that may exist within each runningway. During the Final Environmental Impact Statement (FEIS)/Preliminary Engineering (PE) phase, the FTA will require this Preliminary Hazard Analysis and a Threat and Vulnerability Analysis. These assessments are early elements which receive continuous attention as components of the Safety and Security Certification Plan, which falls under the Safety and Security Management Plan, which falls under the Project Management Plan as project development proceeds.

A detailed risk assessment assigns a level of risk (frequent, probable, occasional, remote, and improbable) and a level of hazard (negligible, marginal, critical, or catastrophic) to each identified hazard. Each of the risks identified should then be assessed to determine the potential for damage to property, personnel, and operations. Based on the level of risk and the estimated probability of the identified hazard occurring, priorities should be set to mitigate hazards. Recommendations to eliminate or control hazards should be identified and documented.

Runningways on airport property will require early and continuing coordination with the Metropolitan Airports Commission (MAC), Federal Aviation Administration (FAA), and Transportation Security Administration (TSA).

5.3.5.3. *Intersecting Modal Safety and Security*

Runningway design should incorporate measures to assure the safe operation of the transitway and intersecting modes.

5.3.5.4. *Agency Coordination*

Agency coordination should be established and maintained via a documented plan developed with the concurrence of all agencies with jurisdiction over facilities within or adjacent to which LRT runningways are developed. It is recommended that the transit operating agency establish a peer relationship with one or more other agencies in the United States which operate a similar modern low-floor LRT system. Periodic communication with such peer agencies to compare system experience may assist the Twin Cities in addressing common issues.

5.3.5.5. *Emergency Preparedness*

Access to LRT runningways in an emergency should be a component of overall runningway design.

5.3.5.6. *Intrusion Detection in Sensitive Areas*

Runningway design should address the need for an intrusion detection system in sensitive areas along the runningway, for example, where tunnels and bridges are present, or freight rail tracks are adjacent. If the presence of snow or any substance is known to prevent effective detection of vehicle intrusion into the LRT runningway at at-grade intersections or along adjacent facilities, the transit operating agency should take appropriate action to safeguard transit users, roadway users, bicyclists, and pedestrians.

5.3.6. Providing for Intersecting Modes

5.3.6.1. *Street Intersections*

LRT runningways may intersect roadways and/or streets. Designers should provide safety precautions to professionally respond to the safe operation of the intersection. Intersection control may be either active or passive, depending on factors such location context, traffic volume, and sight lines specific to each location. Examples of active intersection control mechanisms include automatic gates, flashing lights, bells, and changeable message signs such as Central Corridor LRT's blank out signs. When a train is approaching, the black blank out signs will flash a train image. Examples of passive intersection control mechanisms include stop signs, "z-type" pedestrian crossings such as used on University Avenue for Central Corridor LRT unsignalized pedestrian crossings, and signage that is static.

5.3.6.2. *Rail Intersections*

In addition to the equipment noted for autos and trucks, AREMA standards should be implemented for crossings with active railroad lines. These crossings fall under FRA jurisdiction.

5.3.6.3. *Bicycle Intersections*

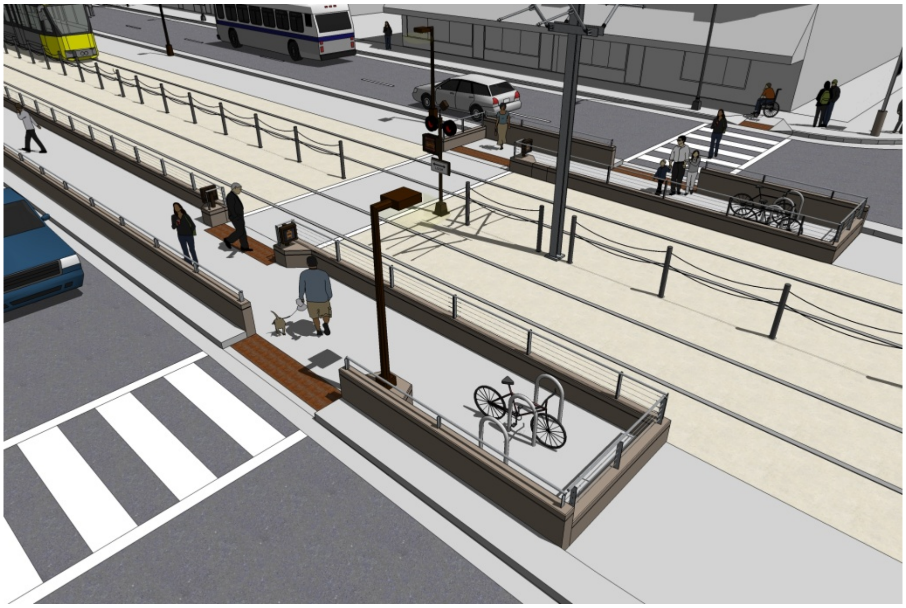
Bicyclists should always be considered in the design of rail crossings. Intersecting track should be paved and safe crossing clearance and signal timing for bicycle crossings of runningways should be provided. Crossings should be considered during the design phase at trail or bike lane crossings as well as general roadway crossings. Fencing or other protective barriers should be considered based on local conditions.

5.3.6.4. *Pedestrian Intersections and Crosswalk Spacing*

An analysis should be conducted to address the location, frequency and volume of pedestrian crossings, including wheelchairs, at intersections and recreational trails adjacent to rail runningways. Intersecting track should be paved. ADA provisions establish the minimum requirements for safe crossings, sidewalk dimensions and features, and Mn/MUTCD establishes the minimum requirements for intersection clearance and signal timing for pedestrians. Because transitways are planned and designed to encourage access by customers walking or traveling by bicycle, the established minimum standards may not be appropriate. Transitway planners and designers should assess bicycle and pedestrian needs at all runningway crossings and evaluate whether minimum standards or additional accommodations are appropriate. If additional accommodations are more appropriate, planners and designers should refer to other guidance including, but not limited to, the *Federal Highway Administration's (FHWA) Design Guidance Accommodating Bicycle and Pedestrian Travel: A Recommended Approach* (http://www.fhwa.dot.gov/environment/bikeped/design.htm).

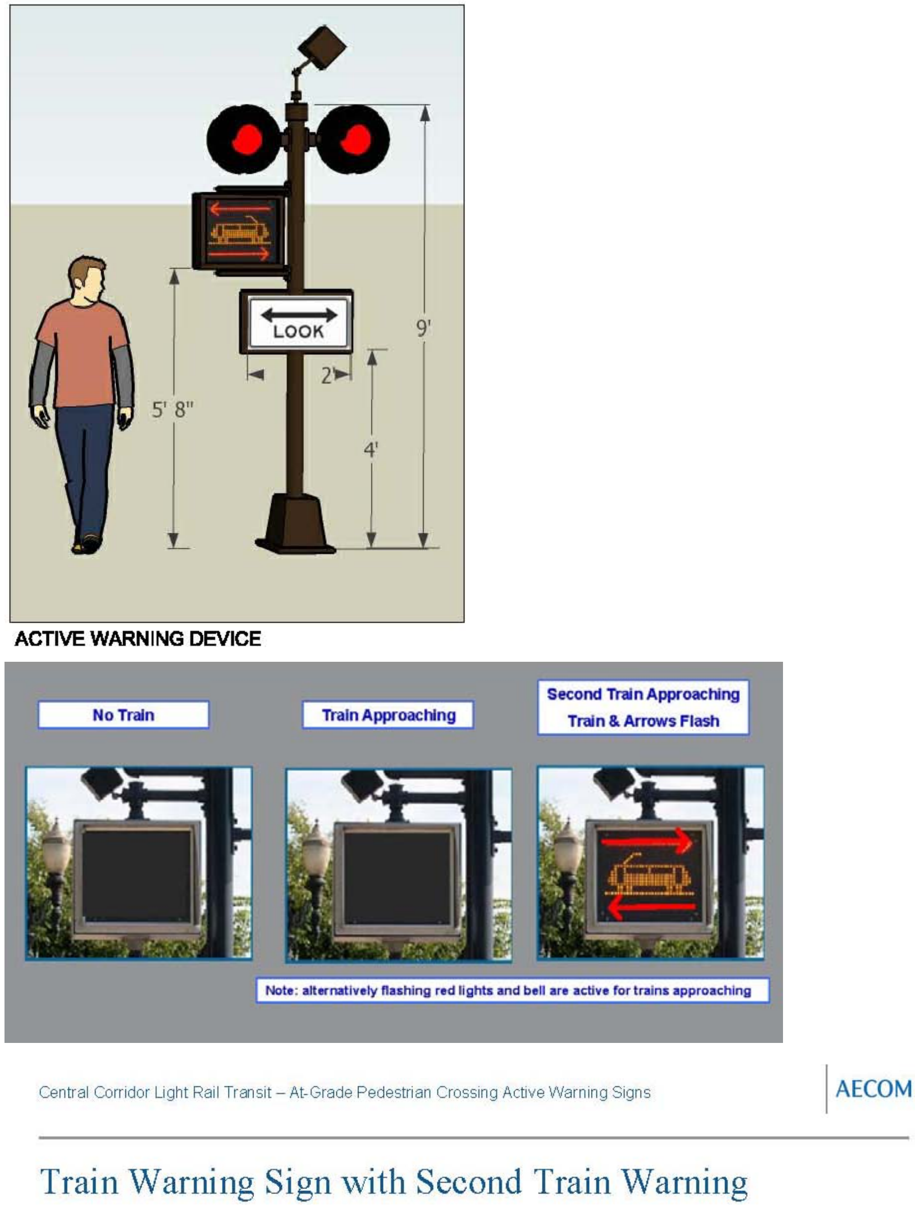
Crosswalks should be located and spaced at stations as directed by the *CCLRT Design Criteria*. Crosswalks between stations should be located at signalized intersections whenever possible. At unsignalized intersections in high-volume pedestrian areas such as downtowns or commercial nodes along University Avenue, crosswalks should be equipped with passive intersection control such as "z-type" directional crossing paths, pavement markings, pedestrian refuge medians, and active train warning signage. Figure 5-2 illustrates a “z-type” pedestrian crossing at an unsignalized intersection on University Avenue. Figure 5-3 illustrates the active warning devices included at these “z-type” crossings.

Figure 5-2 "Z-type" Pedestrian Crossing at Unsignalized Intersection



Source: CCLRT Project Office

Figure 5-3 Active Train Warning Devices at "Z-type" Pedestrian Crossings



Mid-block crossings between stations and between street intersections should be avoided. Where stations have two exit points, and only one is at a signalized intersection, the other exit point should be equipped with control such as noted above.

Resources such as *Minneapolis Design Guidelines for Streets and Sidewalks* and *St. Paul Central Corridor Bicycle and Pedestrian Plan* provide helpful guidance.

Fencing or other protective barriers should be considered based on local conditions.

5.4. COMMUTER RAIL

5.4.1. Fundamental Laws and Underpinning Planning Requirements

All Twin Cities Commuter Rail runningway guidelines should comply with appropriate federal, state, and local regulations. In right-of-way owned by a private railroad, or where other railroad trackage rights affect the design of runningways, Commuter Rail runningways should be designed consistent with railroad requirements.

Where acceptable to the owning railroad, Twin Cities Commuter Rail corridors should follow the *Northstar Corridor Rail Project Design Criteria (Northstar Design Criteria),* September 2006, which is available from Metro Transit on request.

Additional Commuter Rail runningway, or guideway design, resources include:

5.4.1.1. *Laws and Regulations*

- United States Department of Transportation (US DOT) Final Rule, Transportation for Individuals with Disabilities
- Americans with Disabilities Act (ADA)
- U.S.C. Title 49, Section 20152- Swift Rail Development Act 1994 Key Regulatory/Legal References Federal Railroad Administration (FRA) (49 CFR 200-299)
- FRA/FTA Joint Policy on Shared Corridors
- Title VI of the Civil Rights Act of 1964
- National Environmental Policy Act (NEPA)
- Minnesota Environmental Policy Act (MEPA)
- Minnesota Statutes 219.46 governing rail clearances

Commuter Rail lines will need to comply with Congressionally-mandated laws concerning Positive Train Control (PTC) by December 2015. Public Law PL 110-432, signed by President October 16, 2008. FRA final rule issued January 12, 2010.

5.4.1.2. *National/State Design Standards*

- Relevant American Railway Engineering and Maintenance of Way Association (AREMA) standards and recommended practices, including
- Manual for Railway Engineering and Portfolio of Trackwork Plans
- AREMA Recommended Practices for Highway Rail Grade Crossings
- Relevant American Public Transportation Association (APTA) standards and recommended practices
- Relevant American Association of State Highway and Transportation Officials (AASHTO) standards and recommended practices
- Relevant National Fire Protection Association (NFPA) standards and recommended practices
- Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways (MnMUTCD)

- Mn/DOT Road Design Manual
- Mn/DOT State Aid Manual

5.4.1.3. ***Local Design Guidance***

Northstar Corridor Rail Project Design Criteria, September 2006

For most issues, Commuter Rail design guidance for facilities related solely to Commuter Rail operation is provided in the *Northstar Design Criteria*, September 2008, (available from Metro Transit on request). Design within facilities owned by a private railroad follow AREMA standards and must be coordinated with the owner.

Modifications to AREMA standards due to local conditions may be made with FRA approval. Modifications should be based on a safe operating history, described and documented in the system's safety program plan (or another document that is referenced in the system safety program plan). Documentation of alternate practices should:

- Identify the specific rail transit safety standard requirements that cannot be met
- State why each of these requirements cannot be met
- Describe the alternate methods used
- Describe and substantiate how the alternate methods do not compromise safety and provide a level of safety equivalent to the practices in the APTA safety standard

Guidance from Local Jurisdictions

Local jurisdictions may also have design guidance and/or local policies relevant to integrating municipal facilities when transit runningways traverse or cross city streets, sidewalks and bikeways. Current municipal guidance includes:

- *St. Paul Central Corridor Bicycle and Pedestrian Plan* (http://stpaul.gov/index.asp)
- *Access Minneapolis*, Street and Sidewalk Design Guidelines (http://www.ci.minneapolis.mn.us/publicworks/trans-plan/DesignGuidelines.asp)
- *Minneapolis Downtown Action Plan*
- *Minneapolis Pedestrian Master Plan*
- *Minneapolis Bike master Plan and Bicycle Design Guidelines*

The section on transit facilities in the *Access Minneapolis*, Design Guidelines for Streets and Sidewalks, Pedestrian Facility Design, October 26, 2009 provides s a good example of local guidance.

5.4.2. Physical Characteristics of Commuter Rail Runningways

5.4.2.1. ***Number/Direction of Tracks***

Commuter Rail runningways should generally be designed as double-track facilities to provide bi-directional service. Where a low level of activity exists, single-track operation may be feasible and should be substituted, with passing sidings as appropriate.

5.4.2.2. *Runningway Width*

Commuter Rail runningway widths should be consistent with legal requirements, owning railroad requirements (where applicable), and AREMA and FRA standards.

5.4.2.3. *Pavement Type*

Consistent with standards established for the Northstar Line, Commuter Rail runningways are on ballasted track except at-grade crossings, where track may be either embedded or direct fixation. Street reconstruction in a public street or intersection to accommodate Commuter Rail tracks should be accomplished in coordination with the agency with jurisdiction over the roadway and owning railroad.

5.4.2.4. *Pavement Depth*

Where Commuter Rail runningways contain paved track, pavement depth should be consistent with the *Northstar Design Criteria*.

5.4.2.5. *At Grade/Grade Separated*

Commuter Rail runningways will be at-grade to minimize cost, using existing railroad grade separations. Additional grade separations will be considered where dictated by safe operating conditions and in coordination with the host railroad following a complete assessment of potential benefits and costs. Costs for additional grade separations benefitting the broader transportation system should be shared among benefitting organizations, including any transit authority.

Grade separations are limited to major barriers by cost and physical constraints. Major barriers include other railroads, water bodies, freeways, and principal arterials.

Where structures or tunnels are required, clearance requirements and all design considerations should be consistent with Northstar Corridor design criteria.

Where Commuter Rail runningways are proposed on pre-existing structures not owned by the Metropolitan Council or Metro Transit, such structures should be evaluated or modified to accept intended loads. Any evaluation or modification is subject to review and approval by the owning entity.

Opportunities for future grade separations should be considered as congestion on both intersecting facilities and the Commuter Rail runningway builds. Right-of-way preservation should be considered when projected Commuter Rail headways and/or train consists modeled during the design phase indicate grade separation may be needed by the end of the projection period (eg. 2030).

5.4.2.6. *Runningway Placement/Direction Relative to Other Transportation Rights of Way*

Clearances are governed by Minnesota Statutes 219.46 and reflected in AREMA standards. For Minnesota, minimum clearances for tangent track vary from 14- to 19-feet, center line to center line of track. *(*source: *AREMA Manual for Railway Engineering, Methods and Procedures*, Table 28-3-3, Legal Clearance Requirements by State.*)* Increased clearances are required for non-tangent track. Guidelines cited below are for general guidance and should be confirmed based on project-specific conditions.

Rail – Commuter Rail runningways may include LRT tracks within the railroad right-of-way, or have LRT tracks adjacent to the railroad right-of-way. When within Commuter Rail runningway, the private railroad will stipulate the clearance and barrier type requirements to separate the two types of facilities. Typically 25- to50-foot minimum from center line of both freight and LRT trackage is required. A crash barrier between the two types of service is also usually required. (source: *BNSF Railway – Union Pacific*

Railroad Guidelines for Railroad Grade Separation Projects, and *Resor , Catalog of "Common Use" Rail Corridors,* sponsored by US DOT, FRA).

When the Commuter Rail runningway is adjacent to LRT right-of-way, recommended minimum clearance required is 15-feet from center line of outside freight rail track to near edge of LRT right-of-way. The 15 feet allows for a safety walkway between the track and the fence. If a full ballast section with a drainage ditch is used, 25 feet is needed. (source: CH2M Hill rail engineering staff). A fence would be located on the right-of-way line.

Pedestrian/Bicycle Path – For pedestrian and bicycle paths adjacent to Commuter Rail runningway, minimum 15 to 25 feet from center line of outside track to edge of pedestrian/bike right-of-way is recommended. Fencing is preferred.

5.4.2.7. ***Interlock/Crossover/Special Requirements***

Design considerations should be consistent with the *Northstar Design Criteria*.

5.4.2.8. ***Time-of-Day Runningway Controls***

Time-of-day, or temporal, separation will depend on both freight and Commuter Rail service frequencies and speeds. When temporal separation is a planned operating strategy, design considerations should be coordinated with the operating freight railroad and should be consistent with the *Northstar Design Criteria*.

5.4.2.9. ***Traffic Signal Type and Interaction***

Railroad signaling should be as prescribed by FRA and AREMA standards.

5.4.2.10. ***Backup Power for Corridor Runningway Systems***

Commuter Rail runningways do not include power outside of stations, as power is in the locomotive powering the train, consistent with the *Northstar Design Criteria*.

5.4.2.11. ***Lighting***

Design considerations should be consistent with the *Northstar Design Criteria*.

5.4.2.12. ***Barrier Types/Setbacks: Physical, Roadway Striping, Fencing***

Design considerations should be consistent with the *Northstar Design Criteria*, and as noted in Section 5.4.2.6 above.

5.4.2.13. ***Landscaping***

Design considerations should be consistent with the *Northstar Design Criteria*.

5.4.2.14. ***Signage***

Design considerations should be consistent with the *Northstar Design Criteria*.

5.4.2.15. ***Noise/Vibration Considerations***

Because Commuter Rail operates in a freight railroad environment, the potential for noise and vibration is anticipated to be minimal. Where mitigation measures are determined to be necessary, technology, components, and materials should be considered as potential strategies.

5.4.3. Addressing Operation of Commuter Rail Runningways in Design

5.4.3.1. *Communications and Central Control*

As *Northstar Design Criteria* is silent on this element, design considerations should be consistent with *CCLRT Design Criteria* guidance.

5.4.3.2. *System Compatibility*

Design considerations should be consistent with *Northstar Design Criteria* guidance.

5.4.3.3. *Contingency Planning*

Runningway design should consider operational breakdown situations, which may include power outages, storm damage, stalled vehicles within the runningway, crashes, and other unforeseen circumstances. While a contingency plan would be a system operating element, runningway designers should be cognizant of potential needs for access to accommodate:

- Bus boarding and alighting access points of sufficient size to accomplish bus bridges
- Emergency service by first responders

5.4.4. Addressing Maintenance of Commuter Rail Runningways in Design

5.4.4.1. *Impact on Design Features*

Design considerations should include selecting materials for impact resistance, wear, strength, weathering qualities, and standardized to facilitate repair or replacement, consistent with *Northstar Design Criteria* guidance.

5.4.4.2. *Snow Removal*

Arrangements for snow removal are not typically necessary within Commuter Rail runningways due to track and vehicle design and because, on the rare occasion when it is necessary, it is a responsibility of the owning railroad (which is typically an organization other than the transit authority). Snow removal at stations is addressed in the Stations and Support Facilities chapter.

5.4.4.3. *Repairs and Refurbishments/Upkeep*

Responsibility for track improvements, repairs and refurbishments within runningways should be negotiated and documented in an agreement with the right-of-way owner, typically a freight railroad. Responsibility for repairs within publicly-owned Commuter Rail runningways should also be documented in a negotiated agreement between the owning agency and the transit operator, if different parties.

5.4.4.4. *Interagency Agreements/Protocols*

Commuter Rail operations within private right-of-way are to be coordinated, negotiated, and agreements documented with the host railroad or other right-of-way owner. Agreements are to document responsibility for maintenance of Commuter Rail runningways. Agreements are to stipulate that inspection and maintenance of runningways should not interfere with the normal functioning of the rail service, either passenger or freight, unless alternate safety measures approved by FRA, the owning railroad, and the lead agency have been implemented.

5.4.5. Addressing Safety and Security of Commuter Rail Runningways in Design

5.4.5.1. *Design Review for Safety and Security*

The FRA will require a collision hazard analysis. Such analysis becomes part of the overall project management plan as the project progresses through the design process.

For non-FTA- funded projects, early in the design process, a safety evaluation should be made using a documented methodology such as that recommended by Operation Lifesaver. Operation Lifesaver is a non-profit, international continuing public education program first established in 1972 to end collisions, deaths and injuries at places where roadways cross train tracks, and on railroad rights-of-way. Operation Lifesaver programs are sponsored cooperatively by federal, state, and local government agencies; highway safety organizations, and the nation's railroads.

The methodology should identify potential hazards related to persons (employees, passengers, pedestrians, and members of the general public), trains, equipment, highway vehicles, and other property. Recommendations affecting the design of runningways to eliminate or control hazards should be identified and documented.

5.4.5.2. *Agency Coordination*

Agency coordination should be established and maintained via a documented plan developed with the concurrence of all agencies with jurisdiction over facilities within or adjacent to which Commuter Rail operates. Coordinating entities are expected to include the host railroad, Mn/DOT, county and municipal authorities, the State Police, local police, and fire departments.

5.4.5.3. *Emergency Preparedness*

Runningway design should provide for access for emergency vehicles, and emergency access should be a component of an overall safety plan. All aspects of the system safety plan should be coordinated with emergency service providers including law enforcement, fire and life safety equipment, and other first responders.

5.4.5.4. *Intrusion Detection in Sensitive Areas*

Runningway design should address the need for an intrusion detection system in sensitive areas along the runningway, for example, where tunnels and bridges are present, or LRT tracks are adjacent. If the presence of any substance is known to prevent effective detection of vehicle intrusion into the Commuter Rail runningway at at-grade intersections or along adjacent facilities, the transit operating agency should coordinate with the owning railroad to take appropriate action to safeguard transit users, roadway users, bicyclists, and pedestrians.

5.4.6. Providing for Intersecting Modes

5.4.6.1. *Street Intersections*

AREMA standards should be implemented for all at-grade crossings. Commuter Rail runningway grade crossings should incorporate the following:

- Grade crossing warning system, which may include gate arms, warning bells, flashing lights, and other stationary audible warning devices
- Roadway traffic signal pre-emption interconnections (if applicable)
- Vehicle intrusion detection systems

A backup power supply should be provided, with the capacity to operate the warning system for a reasonable length of time during a period of primary power interruption.

Modifications to AREMA standards may be made due to local conditions, subject to FRA, FTA, railroad, and local jurisdiction approval.

5.4.6.2. *Rail Intersections*

AREMA standards should be implemented for crossings with active railroad lines.

5.4.6.3. *Bicycle Intersections*

Safe crossing clearance and signal timing for bicycle crossings of Commuter Rail runningways should be provided.

5.4.6.4. *Pedestrian Intersections*

Safe crossing clearance and signal timing for pedestrian crossings of Commuter Rail runningways should be provided . ADA provisions establish the minimum requirements for safe crossings, sidewalk dimensions and features, and MnMUTCD establishes the minimum requirements for intersection clearance and signal timing for pedestrians. Designers need to consider the multiple uses to be accommodated within sidewalk zones when designing pedestrian interacting points with transit runningways. Because transitways are planned and designed to encourage access by customers walking or traveling by bicycle, the established minimum standards may not be appropriate. Transitway planners and designers should assess bicycle and pedestrian needs at all runningway crossings and evaluate whether minimum standards or additional accommodations are appropriate. If additional accommodations are more appropriate, planners and designers should refer to other guidance including, but not limited to, the FHWA's Design Guidance Accommodating Bicycle and Pedestrian Travel: A Recommended Approach" (http://www.fhwa.dot.gov/environment/bikeped/design.htm)."Design considerations should be consistent with the *Northstar Design Criteria*.

5.5. HIGHWAY BRT

This section discusses runningways for BRT located within freeway and other multi-lane highway corridors designed for posted speeds equal to or greater than 45 miles per hour, consistent with the *Mn/DOT Road Design Manual* definition of highways. This includes runningways supporting Highway BRT station-to-station and express services.

The Twin Cities roadway network is subdivided into principal and minor arterials, and collector and local streets. Categories are based on the amount of local access provided, the lengths of trips accommodated, and the traffic volumes carried. Highway BRT runningways are typically located on principal and minor arterial roadways.

5.5.1. Types of Highway BRT Runningways

Highway BRT runningways provide transit with a travel-time advantage under congested roadway conditions and include:

- Managed lane: BRT within a managed lane such as a high occupancy vehicle (HOV), high occupancy toll (HOT) lane, or priced dynamic shoulder lane (PDSL).
- Bus shoulder lane: BRT along a designated bus-shoulder, where the shoulder is the regular runningway for the bus regardless of adjacent traffic conditions. Buses are the exclusive users of the roadway shoulder except for general traffic turning movements and incident management or

emergency shoulder use. Current legislation limits speeds in bus-shoulder lanes to 35 miles per hour or 15 miles per hour over the speed of general traffic, whichever is less.

The following sections also provide information for bus-only shoulder operation, which is an operational strategy, not a type of BRT runningway, and is a special use of highway shoulders for buses only when congested conditions exist on the highway or freeway. Current legislation states buses may use shoulders in posted areas only when traffic in general purpose lanes is moving at speeds lower than 35 miles per hour; speeds during bus only shoulder operation are limited to 35 mile per hour or 15 miles per hour above general traffic speeds, whichever is less. This operational strategy is shown as a benchmark comparison for bus-shoulder lane and managed-lane runningways.

Some facilities will connect into another form of BRT runningway. For example, the I-35W managed lane will connect in downtown Minneapolis to the Marquette and Second dual bus lanes. The dual bus lanes are addressed in the Arterial BRT section of this document.

Information relevant to each type of Highway BRT runningway is provided in tables later in this section.

These guidelines do not discuss dedicated busways, which are fixed guideway runningways completely separate from the roadway network and dedicated to bus traffic only. While the Twin Cities has a dedicated busway connecting the Minneapolis and St. Paul campuses of the University of Minnesota and the region's long-range transportation plan, the *2030 Transportation Policy Plan* (TPP) includes it as a type of transitway to be considered for development in the region, no new dedicated busways have been advanced beyond conceptual engineering to-date. Guidelines for dedicated busway runningways can be developed in the future as lessons are learned in the region.

5.5.2. Fundamental Laws and Underpinning Planning Requirements

A number of applicable national, state, and local regulations, standards, and practices presently shape BRT facility design. Most Highway BRT runningway design topics are addressed in these documents, which include but are not limited to those listed below.

5.5.2.1. ***Laws and Regulations***

- US DOT Final Rule, Transportation for Individuals with Disabilities
- Americans with Disabilities Act (ADA)
- Title VI Regulations of the Civil Rights Act of 1964
- National Environmental Policy Act (NEPA)
- Minnesota Environmental Policy Act (MEPA)

5.5.2.2. ***National/State Design Standards***

- *AASHTO Geometric Design of Highways*
- National Academy of Sciences, *Transportation Research Board (TRB) Highway Capacity Manual*
- Relevant APTA standards and recommended practices, including
    - *APTA Guidelines for Design of Rapid Transit Facilities*
    - *APTA Transit Sustainability Guidelines*

- *Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways* (MnMUTCD)
- *Mn/DOT Road Design Manual*
- *Mn/DOT State Aid Standards Minnesota*
- *Guidelines for the Design of Transit Related Roadway Improvements* (Metropolitan Transit Commission, 1983)
- *Metro Transit Bus System Safety Program Plan*

5.5.2.3. ***Local Design Guidance***

Highway BRT runningways should be developed in accordance with the current specifications and design standards of the entity with jurisdiction over the facility. BRT highway runningway elements generally reflect Mn/DOT road design standards and guidelines such as those listed below, though designs for runningway elements may adhere instead to the standards of the county or city roadway jurisdiction.

- *Mn/DOT Road Design Manual*
- *Mn/DOT Traffic Engineering Manual*
- *Mn/DOT I-94 Managed Lanes Study Final Report*
- Minneapolis/ St Paul Metropolitan Area Public Transportation Memo of Understanding - Mutual Aid

Bus facility design documents also direct that design be consistent with the type of BRT vehicle to be used. Conflicts should be addressed during the runningway design process. Designers will need to work with both the roadway jurisdiction (Mn/DOT or county) as well as the transit operating agency (Metro Transit and/or suburban transit provider) to evaluate the trade-offs inherent in multimodal roadway design. The *Mn/DOT Highway Design Manual* and/or the *Mn/DOT Traffic Engineering Manual* should be used for state highways and state-aid guidance, along with local guidance, should be used for county highways. Mn/DOT resource documents are available from the Minnesota Department of Transportation website (www.dot.state.mn.us). Other national and state design standards should be used as applicable.

Components of BRT runningways not included in the sources cited are addressed in the material which follows.

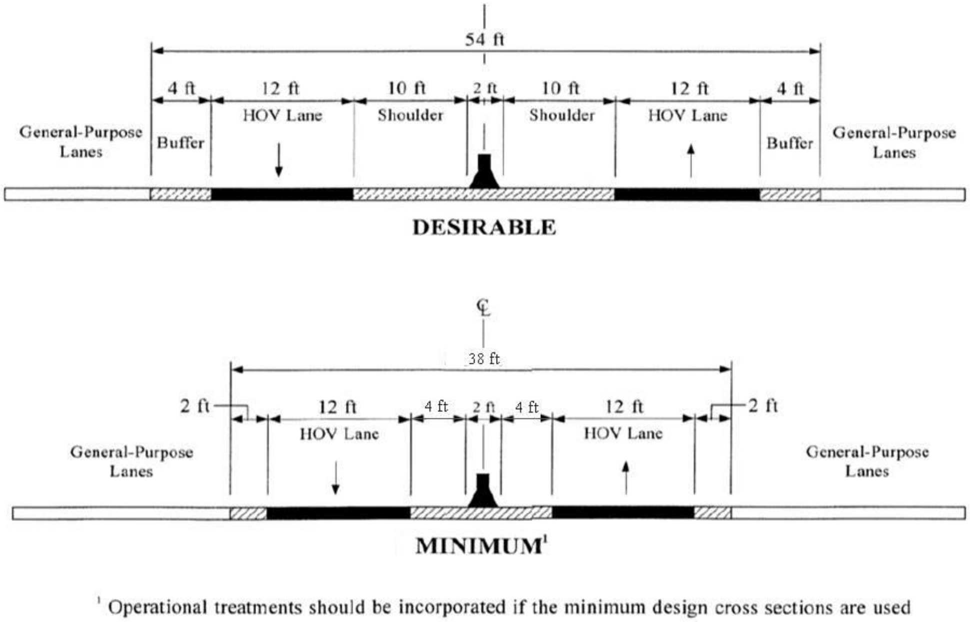
5.5.3. Physical Characteristics of Highway BRT Runningways

5.5.3.1. ***Corridor/Lane Width***

Highway BRT runningway widths are summarized below. Lane width should be sufficient to accommodate required horizontal clearance for the types of buses operating in the facility, as described in Mn/DOT guidance. Buses shall not stop in managed lanes in freeways; sufficient pull off lanes or passing lanes shall be provided to facilitate a station.

Figure 5-4 illustrates example managed-lane cross-sections for freeways with active traffic management. (source: S. Pedersen, Mn/DOT, modified from graphic incorporated in I-94 Managed Lanes Study, Fig. 2)

Figure 5-4 Example Managed-Lane Cross-Sections for Freeways with Active Traffic Management



Lane widths identified in the table below do not include the width of gutters when a curbed section is used.

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
12’ standard plus buffers	12’ desirable and required in areas of new construction or reconstruction, 10’ minimum, 11.5’ minimum on structures	

5.5.3.2. ***Number, Placement and Direction of Lanes***

Managed Lane	Bus-Shoulder Lane	Bus–Only-Shoulder Operation (Benchmark)
One lane in each direction in most cases. May be a single-lane or dual-lane reversible facility where indicated by significant one-way directional split of traffic and right-of-way constraints.	One lane in each direction, same direction as traffic flow. Generally outside (right) shoulder placement. Shoulder lanes within at-grade facilities present shared use- conditions with right-turning vehicles.	

Depending on station locations and service plan characteristics, it may be desirable to have more than one type of runningway in a corridor. For example, station-to-station service on a Highway BRT corridor may have offline stations that do not allow extensive use of a managed lane prior to build-out of all online stations. If right-of-way allows, bus only shoulder operation may be desired under these circumstances. In the case of reversible managed-lane situations such as I-394, bus only shoulder operation is particularly necessary in the off-peak direction for station-to-station services to allow competitive travel time and efficient bus cycling.

5.5.3.3. *Drainage Systems*

Highway BRT runningway drainage should be designed to state standards and coordinated with host highway drainage design.

5.5.3.4. *Pavement*

Highway BRT will typically operate on normal roadway pavement. For all types of Highway BRT runningways, pavement should be designed and maintained to deliver the desired ride quality, have sufficient strength to support repeated wheel loadings from transit and any other vehicles using the runningway, and its mix design should be consistent with *Mn/DOT Road Design Manual* provisions (source: *Guidelines for the Design of Transit Related Roadway Improvements*, Metropolitan Transit Commission, 1983).

5.5.3.5. *At Grade/Grade Separated*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
Sufficient to provide active demand and system management, generally fully access-controlled (grade-separated)	May be grade-separated or at-grade, consistent with roadway facility in which the lane is located	

5.5.3.6. *Interlock/Crossover/Special Requirements/Reverse Direction Running*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
In reversible facilities such as I-394 HOT lane, directional flow is controlled by time of day, gates and signage In median BRT implementation, signal- and/or gate-controlled crossovers may be implemented at stations.	N/A	

5.5.3.7. *Separation via Time of Day Runningway Controls*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
May include time of day restrictions. Examples: I-35W, I-394	N/A	May include time of day restrictions to facilitate transit reliability during regular periods of congestion while maintaining general travel capacity during uncongested periods. Within allowed periods, only used by transit when general travel lanes are congested (speeds below 35 mph).

5.5.3.8. *Traffic Signal Type and Interaction*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)

Controlled at system access points (ramp meters intersection signals)	When in access-controlled facility (grade-separated), controlled at system access points. Within at-grade facilities, traffic signal interaction should be coordinated with the jurisdictional authority, to give transit every feasible travel advantage while maintaining reasonable traffic operations when applicable.

5.5.3.9. *Backup Power for Corridor Runningway Systems*

Backup power sources for Highway BRT runningways are typically integrated into overall facility power for signals, lighting, etc, consistent with the design and maintenance standards of the jurisdictional authority.

5.5.3.10. *Lighting*

Lighting for Highway BRT runningways is typically integrated into the lighting for the overall highway facility, consistent with the governing standards of the jurisdictional authority.

5.5.3.11. *Barrier Types/Setbacks: Physical, Roadway Striping, Fencing*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
Vary depending on vehicle characteristics, speeds, amount of traffic, right-of-way and other conditions, and should follow Mn/DOT and local jurisdictional guidelines	Not barrier-separated. Dictated by MnMUTCD provisions. May include driver-eye-level roadway signage and lane striping/pavement markings. May also include overhead lane signage and distinctive pavement treatment such as colored pavement.	

5.5.3.12. *Landscaping*

Landscaping for Highway BRT runningways is typically integrated into the landscaping of the overall highway facility, consistent with the governing standards of the jurisdictional authority.

5.5.3.13. *Signage*

Signs and graphics should comply with MnMUTCD requirements and the goals, objectives, and provisions of the jurisdictional authority.

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
Signage for BRT operation to be included in managed-lane signage	Following MnMUTCD requirements, BRT shoulder lane operation should be clearly and regularly signed to clearly identify BRT lane designation, including areas dedicated to buses. Signage may include specific transit logo or text on lanes and/or signs. Turn areas should be identified.	

5.5.3.14. *Noise/Vibration Considerations*

The potential for noise and vibration reduction within BRT runningways should be considered both during the planning of alignments and when identifying the operating characteristics of BRT vehicles.

5.5.4. Addressing Operating and Maintenance of Highway BRT Runningways in Design

5.5.4.1. *Enforcement Strategy*

Enforcement plans should be implemented with performance targets and interagency agreements. Managed lane enforcement in particular should be tailored to corridor needs and requirements to maintain posted speeds in the managed segments.

5.5.4.2. *Runningway Support Infrastructure Considerations*

Runningway infrastructure necessary to the operation of the BRT system should be maintained by the owning entity, with participation in design and maintenance coordinated with transit lead agency. Wherever possible, the use of existing infrastructure and facilities should be maximized when choosing transit alignments.

5.5.4.3. *Snow Removal*

Snow removal will be the responsibility of the roadway owner, handled as an integral part of snow removal on the overall highway. Snow removal at stations is addressed in the Stations technical document.

5.5.4.4. *Repairs and Refurbishments/Upkeep*

Responsibility for BRT runningway repairs and refurbishments should be negotiated and documented in an agreement with the agency with jurisdiction over the roadway.

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
Coordinated with Mn/DOT, Mn State Patrol, and/or local jurisdictional law enforcement	Depending on facility jurisdiction, coordinated with Mn/DOT, Mn State Patrol, and/or local law enforcement	

5.5.5. Providing for Intersecting Modes

5.5.5.1. *Intersecting Auto, Truck, Pedestrian and Bicycle Traffic*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
N/A	N/A in grade-separated facilities. Within at-grade facilities, intersections should be designed to provide safe, efficient transitway crossings for all transportation modes. Special attention should be given to providing convenient and safe at-grade accommodations for pedestrians or people on bicycles crossing transitway runningways. In general, bicycle and pedestrian crossings should be located at signalized street intersections whenever possible. Mid-block crossings between stations and street intersections should be avoided. At-grade bicycle and pedestrian features may include, but are not limited to: • Improved bicycle and pedestrian facilities such as more visible crossings using pavement treatments, colors, markings, and/or warning signals/signage; pedestrian refuge medians; roadway curb extensions; intersection countdown timers, or crosswalks with passive crossing control (e.g., “z-type” crossings proposed on University Avenue) • Roadway modifications such as intersection traffic signal timings adjusted to give equal importance with other traffic, additional traffic signals, elimination of conflicting turn movements – especially free-right turn movements, and other intersection modifications that improve convenience and safety for pedestrians and bicyclists. Grade-separated bicycle/pedestrian crossings may be considered where there is no technically feasible at-grade crossing option, where benefits to the broader transportation system are shown to be significant, or where required by the runningway’s owning entity (e.g., railroad). Evaluation criteria that should be considered when assessing the need for grade-separated crossings include: • High pedestrian volumes • Long pedestrian crossing distances • Presence of poor sight distance to see crossing transit patrons • Roadway average daily traffic volumes of more than 35,000 and 80th percentile speeds documented at more than 40 mph • Distance of greater than 600-feet to the nearest alternative “safe” crossing (i.e., controlled intersection or existing under-/over-pass • Potential to coordinate with adjacent facilities such as a bike trail or sidewalk system If an at-grade crossing is feasible, provision of a grade-separated bicycle/pedestrian crossing may be a local betterment.	

5.5.5.2. *Intersecting Rail Traffic*

Managed	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)

Lane		
N/A	N/A in grade-separated facilities. . Within at-grade facilities where FRA has jurisdiction over the railroad, in addition to the equipment noted for autos and trucks, AREMA standards should be implemented for crossings with active railroad lines.	

5.5.5.3. *Adjacent Bicycle Paths*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
N/A	Where adjacent to a bicycle lane, separation should be distinguished by striping and signage.	

5.5.5.4. *Adjacent Pedestrian Paths*

Managed Lane	Bus-Shoulder Lane	Bus-Only-Shoulder Operation (Benchmark)
N/A	Where adjacent to a sidewalk or other walkway, separation should be distinguished by curbing.	

5.6. ARTERIAL BRT

This section discusses runningways for BRT located within established, neighborhood-scale thoroughfares that typically have significant commercial nodes at major intersections. Arterial BRT runningway guidelines apply to roadways designed for posted speeds less than 45 miles per hour, consistent with *Mn/DOT Road Design Manual* definitions. The TPP identifies a network of potential Arterial BRT corridors as part of the 2030 Transitway System.

The Twin Cities roadway network is subdivided into principal, minor arterial, collector, and local street functional classification categories, based on speeds, the amount of local access provided, the lengths of trips accommodated, and the traffic volumes carried. Arterial BRT runningways are typically classified as minor arterials and major collector streets, and are surface facilities without grade separations for intersecting traffic, pedestrians or bicycles.

5.6.1. Types of Arterial BRT Runningways

Arterial BRT runningways are usually within existing roadways. These roadways are typically undivided, with or without median barriers at intersections. The BRT runningway may be in dedicated lanes, shared-use lanes, managed lanes, or general purpose mixed traffic lanes with operational advantages. Traffic control is accomplished with signalized, at-grade intersections. Local property access points (i.e., driveways or alleys) are common along Arterial BRT runningways. These local access points are not signalized.

5.6.1.1. *Operation in Mixed Traffic*

Arterial BRT generally operates in mixed traffic, but with travel-time advantages to improve travel time on a corridor-by-corridor basis. An Arterial BRT runningway is likely to include combinations of managed-lane options appropriate to available right-of-way, roadway traffic conditions, and adjoining land use requirements such as on-street parking.

Roadway management options to provide transit advantages to facilitate Arterial BRT include flexibility in the degree of exclusivity:

- In mixed traffic
- In a shared-use lane (for example, shared with right-turning vehicles or shared with bicycles)

Roadway management options also include time-of-day controls:

- Peak-period dedication of one lane in both directions to bus operations and possibly turning traffic
- Peak-period dedication of a lane in the peak-direction only to bus operations and possibly turning traffic

Intersection Treatments include:

- Signal priority - extended green time or shortened red time for BRT vehicles
- Queue jumps, also known as leading bus intervals, allow buses to bypass queued traffic at intersections through a separate signal phase

5.6.1.2. ***Operation in Dedicated Lanes***

Arterial BRT may operate in dedicated lanes within lower-speed roadways. The Marquette and 2nd Avenues paired bus lanes in downtown Minneapolis are an example of Arterial BRT operation in dedicated lanes.

Dedicated-lane operation may be within one-way or two-way streets. Within one-way streets, BRT operates best opposite the flow of general traffic lanes (contra-flow). Contra-flow operation facilitates both right and left turning traffic movements for general traffic as well as BRT. Intersection treatments supporting dedicated lane operations may include signal priority.

5.6.2. Fundamental Laws and Underpinning Planning Requirements

A number of applicable national, state, and local regulations, standards, and practices presently shape BRT facility design. Most Arterial BRT runningway design topics are addressed in these documents, which include but are not limited to:

5.6.2.1. ***Laws and Regulations***

- Americans with Disabilities Act (ADA)
- Title VI of the Civil Rights Act of 1964
- National Environmental Policy Act (NEPA)
- Minnesota Environmental Policy Act (MEPA)

5.6.2.2. ***National/State Design Standards***

- *AASHTO Geometric Design of Highways*
- *TRB Highway Capacity Manual*

- Relevant APTA standards and recommended practices, including
  - *APTA Guidelines for Design of Rapid Transit Facilities*
  - *APTA Transit Sustainability Guidelines*
- *Mn/DOT Road Design Manual*
- *Mn/DOT Traffic Engineering Manual*
- *Mn/DOT State Aid Standards*
- *Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways* (MnMUTCD)

5.6.2.3. ***Local Design Guidance***

- *Guidelines for the Design of Transit Related Roadway Improvements* (Metropolitan Transit Commission, 1983)
- *Metro Transit Bus System Safety Program Plan*
- *St. Paul Central Corridor Bicycle and Pedestrian Plan* (http://stpaul.gov/index.asp)
- *Access Minneapolis,* Street and Sidewalk Design Guidelines (http://www.ci.minneapolis.mn.us/publicworks/trans-plan/DesignGuidelines.asp)
- *Minneapolis Downtown Action Plan*
- *Minneapolis Pedestrian Master Plan*
- *Minneapolis Bicycle Master Plan and Bicycle Design Guidelines*
- Local jurisdictional codes, requirements and procedures

Arterial BRT runningways should be developed in accordance with the current specifications and design standards of the entity with jurisdiction over the roadway which incorporates the runningway. While roadway design generally reflects AASHTO guidelines, bus facility design documents also direct that design be consistent with the type of vehicle to be used. Conflicts between guidance should be addressed during the runningway design process. Designers are encouraged to work with transit operators to evaluate the trade-offs inherent in multimodal roadway design. For cases where a local jurisdiction does not have design guidelines, the *Mn/DOT Road Design Manual* and/or the *Mn/DOT Traffic Engineering Manual* should be used.

Mn/DOT resource documents are available from the Minnesota Department of Transportation website (www.dot.state.mn.us).

5.6.3. Physical Characteristics of Arterial BRT Runningways

5.6.3.1. ***Number/Direction of Lanes***

Arterial BRT should typically operate in one lane in each direction, unless the operational technique proposes operation in the peak-direction only. Arterial BRT can operate in dual lanes, and contra-flow, in high-volume locations such as downtowns. Because this condition requires major roadway reconfiguration, it is considered an exception to the goal of maximizing the transit capacity of the region’s minor arterial commercial corridors identified as candidates for Arterial BRT implementation.

5.6.3.2. *Corridor/Lane Width*

Arterial BRT should operate within the ten- to 12-foot travel lanes typical within minor arterial and major collector roadways.

5.6.3.3. *Pavement*

Arterial BRT should be presumed to operate on normal roadway pavement. Special pavement treatment such as markings and/or color may be used to indicate bus-only operation. Where street reconstruction is feasible, pavement on which Arterial BRT will operate should be designed and maintained to deliver the desired ride quality and have sufficient strength to support repeated wheel loadings from transit (including larger, branded buses) and other vehicles using the runningway.

5.6.3.4. *Runningway Placement Relative to Roadway Lanes*

For outside (right) lane Arterial BRT and in one-way streets where BRT operates in the direction of traffic, several runningway placement options exist, depending on available right-of-way, traffic conditions, and surrounding land use access conditions:

- BRT operates with mixed traffic adjacent to parking, makes limited curb stops at designated BRT stations only (may pull into parking lane or may stop in traffic at curb extensions)
- BRT operates with mixed traffic adjacent to curb, makes limited curb stops at designated BRT stations only, stopping in the traffic lane
- Dedicated BRT and right-turning traffic use the outside (right) travel lane, adjacent to on-street parking (may pull into parking lane or may stop in traffic at curb extensions)
- Dedicated BRT and right-turning traffic replaces on-street parking with a travel lane (may be all day use or just use during peak periods) and stops in traffic lane

In median runningway lanes on two-way streets:

- BRT operates with mixed traffic, shares median travel lane with left-turning traffic.
- Dedicated BRT use of the median travel lane, with separate left-turn bays for traffic (median bus lane)
- Dedicated BRT and left-turning traffic use of the inside travel lane

Under median running, median stations should be located at intersections where left turns are prohibited to reduce conflicts with turning traffic.

5.6.3.5. *Reverse Direction Running*

On one-way streets, Arterial BRT may operate in the reverse direction from general traffic direction (“contra-flow”). BRT operation may be in single or dual lanes, such as the Marquette and Second dual bus lanes in downtown Minneapolis.

Contra-flow running should not be used on two-way streets.

5.6.3.6. *Time-of-Day Runningway Controls*

Time-of-day lane controls, also called temporal separation, is a frequently-used strategy which provides a dedicated runningway for BRT during peak travel periods, while allowing on-street or curb side parking during other periods to accommodate adjacent land uses. Time-of-day lane control is recommended when dedicated BRT runningway segments are not feasible and mixed flow cannot provide a reliable travel-time advantage over local bus.

5.6.3.7. *Traffic Signal Type and Interaction*

Signal priority for both Arterial BRT and local bus service is preferred wherever it can be implemented without significant operational impact to other traffic. Traffic signal interaction should be coordinated with the roadway jurisdictional authority.

5.6.3.8. *Backup Power for Corridor Runningway Systems*

Backup power sources for Arterial BRT runningways are typically integrated into the overall roadway facility power for signals, lighting, etc. consistent with the design and maintenance standards of the jurisdictional authority.

5.6.3.9. *Lighting*

Arterial BRT runningways are incorporated into the roadway in which they operate, which have lighting based on appropriate facility design standards. Where additional runningway lighting is desired for passenger comfort and convenience, lighting height, intensity, and shielding should be coordinated with the local jurisdiction(s) with authority over both the roadway and the neighborhood.

5.6.3.10. *Barrier Types/Setbacks*

Arterial BRT encourages convenient, simple and direct access for transit patrons within the corridor. As such, physical barriers other than those created by station shelters should not be included in runningway design.

Roadway striping is appropriate where the BRT runningway is in a location other than in mixed traffic, for example, in a runningway segment dedicated to BRT, or to complement signage in a time-of-day lane control such as BRT peak period/curbside parking off-peak condition. Barrier types should be consistent with MnMUTCD provisions for pavement markings, signs, and signals.

Fencing is generally not appropriate along Arterial BRT runningways.

5.6.3.11. *Landscaping*

Landscaping and streetscaping added to a roadway as a result of Arterial BRT operation is considered a local betterment.

5.6.3.12. *Signage*

Signage and graphics to identify the BRT service operating in the runningway should comply with MnMUTCD requirements and the goals, objectives, and provisions of the jurisdictional authority, prevailing design standards for the facility, and the transit operator.

5.6.4. Addressing Operations and Maintenance of Arterial BRT Runningways in Design

5.6.4.1. *Enforcement Strategy*

As with Highway BRT, enforcement plans should be coordinated with the owning roadway jurisdiction, implemented with performance targets, interagency agreements, and coordinated with law enforcement.

5.6.4.2. *Runningway Support Infrastructure Considerations*

As Arterial BRT will predominantly operate in mixed traffic, infrastructure support necessary for its operation should be coordinated with the owning roadway entity through interagency agreements.

5.6.4.3. *Snow Removal*

Snow removal will be the responsibility of the roadway owner, handled as an integral part of snow removal on the overall roadway. Snow removal at stations is addressed in the Stations and Support Facilities chapter.

5.6.4.4. *Repairs and Refurbishments/Upkeep*

Responsibility for BRT runningway repairs and refurbishments should be negotiated and documented in an agreement with the agency with jurisdiction over the roadway.

5.6.5. Providing for Intersecting and Adjacent Modes

5.6.5.1. *Intersecting Auto, Truck, Pedestrian and Bicycle Traffic*

Intersections should be designed to provide safe, efficient transitway crossings for all transportation modes. Special attention should be given to providing convenient and safe at-grade accommodations for pedestrians or people on bicycles crossing transitway runningways. In general, bicycle and pedestrian crossings should be located at signalized street intersections whenever possible. Mid-block crossings between stations and street intersections should be avoided. At-grade bicycle and pedestrian features may include, but are not limited to:

- Improved bicycle and pedestrian facilities such as more visible crossings using pavement treatments, colors, markings, and/or warning signals/signage; pedestrian refuge medians; roadway curb extensions; intersection countdown timers, or crosswalks with passive crossing control (e.g., “z-type” crossings proposed on University Avenue, see Figure 5-2)
- Roadway modifications such as intersection traffic signal timings adjusted to give equal importance with other traffic, additional traffic signals, elimination of conflicting turn movements – especially free-right turn movements, and other intersection modifications that improve convenience and safety for pedestrians and bicyclists.

Grade-separated bicycle/pedestrian crossings may be considered where there is no technically feasible at-grade crossing option, where benefits to the broader transportation system are shown to be significant, or where required by the runningway’s owning entity (e.g., railroad). Evaluation criteria that should be considered when assessing the need for grade-separated crossings include:

- High pedestrian volumes
- Long pedestrian crossing distances
- Presence of poor sight distance to see crossing transit patrons
- Roadway average daily traffic volumes of more than 35,000 and 80th percentile speeds documented at more than 40 miles per hour
- Distance of greater than 600-feet to the nearest alternative “safe” crossing (i.e., controlled intersection or existing under-/over-pass
- Potential to coordinate with adjacent facilities such as a bike trail or sidewalk system

If an at-grade crossing is feasible, provision of a grade-separated bicycle/pedestrian crossing may be a local betterment.

The major modal conflict area for Arterial BRT is likely to be direct auto and truck property access at driveways and alley entrances to commercial loading and parking areas. Driveways and alley entrances are typically not signalized, and may be frequent as well as mid-block. The lead agency should coordinate with the local jurisdiction and surrounding property owners to identify options to minimize or mitigate conflict points. Options to consider may include left-turn restrictions during peak periods, loading zone restrictions and cross-street access improvements, and in rare occasions, access closure or relocation to a side street.

5.6.5.2. ***Intersecting Rail Traffic***

Where active railroad lines intersect Arterial BRT runningways, safe crossing clearance should be provided and FRA-compliant, AREMA standards should be followed for signage, crossing lights and crossing gates.

5.6.5.3. ***Adjacent Bicycle Lanes***

Where Arterial BRT runningways are adjacent to a bicycle lane or recreational trail, separation should be accomplished following the guidelines of local jurisdictions, such as the Minneapolis Bike Master Plan and the St. Paul Central Corridor Bicycle and Pedestrian Plan.

5.6.5.4. ***Adjacent Pedestrian Paths***

Where Arterial BRT runningways are adjacent to a pedestrian path/sidewalk, the sidewalk should be at a higher (curb height) elevation than the BRT runningway. Runningway design with adjacent pedestrian facilities should be accomplished following the guidelines of local jurisdictions, such as the M*inneapolis Pedestrian Master Plan* and the *St. Paul Central Corridor Bicycle and Pedestrian Plan*.

5.6.5.5. ***Crosswalk Spacing Guidance***

Crosswalks should be located at Arterial BRT stations, with pedestrians directed to cross at signalized intersections whenever possible. Crosswalks may also be provided at unsignalized intersections, with the addition of, at minimum, pavement markings and pedestrian refuge medians.

The location of safe crossing areas for pedestrians should be determined through design/collaborative review prior to establishing BRT station locations.

Mid-block crossings should be avoided.

5.7. RUNNINGWAY GUIDELINES

After reviewing relevant background information and existing, and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff, the following Runningways Guidelines are recommended for adoption. These guidelines should be considered collectively when making runningway decisions.

A runningway is the linear component of the transit system that forms the right-of-way reserved for the horizontal and vertical clearance requirements of transitway vehicles and ancillary structures or equipment required to operate light rail or commuter rail trains or BRT buses (sometimes called guideway). While the runningway incorporates the space needed to operate transit, it should be differentiated from “right-of-way”, which incorporates the potentially larger area needed to implement the project. For example, “right-of-way” would include additional property that may need to be acquired to relocate facilities that are adjacent to the runningway and need to be moved, such as sidewalks, driveways, light poles, landscaping, etc. Stations and Support Facilities are discussed in the Stations and Support Facilities Guidelines.

5.7.1. Light-Rail Transit Runningways

Light-rail transit runningways should serve LRT only and will generally be at-grade and double track with crossovers and storage tracks provided as needed to support efficient operations.

Ballasted track is lower cost and preferred, with embedded track used where tracks are coincident with roadways including at vehicle and/or pedestrian crossing locations. In tunnels and on bridges, direct fixation track is preferred.

Lane striping, pavement color, pavement texture, and/or barriers (including intertrack or side fencing) may be appropriate to guide, discourage, or prevent access to runningways in areas not designated as a legal crossing and should be used where needed.

Light-rail transit runningways are the linear components of the transit right-of-way containing rail trackage designed for LRT vehicles as well as ancillary facilities such as traction power substations and signal bungalows. Elements of LRT runningway operations and maintenance to be addressed during planning and design include but are not limited to, safety, security, communications and central control, system compatibility, contingency planning, periodic repairs and replacement, and snow removal.

5.7.2. Commuter Rail Runningways

Commuter Rail runningways will generally be at-grade and double track, with single track used only where adequate sidings are provided and its use supports the service operating plan.

Ballasted track is lower cost and preferred, with embedded or direct fixation track used at vehicle and/or pedestrian crossing locations.

Intertrack or side fencing should be used where needed. Grade-separated crossings may be considered where benefits to the broader transportation system, including freight movements, are shown to be significant.

Commuter Rail runningways are the linear component of the transit right-of-way containing rail trackage designed for Commuter Rail vehicles and ancillary facilities such as train signal systems.

Commuter Rail runnningways will often make use of existing freight and inter-city passenger rail runningways, which will direct Commuter Rail planning and design. Consistent with Project Development, Leadership, and Oversight Guidelines, the transitway lead organization is responsible for coordinating with all project stakeholders, including railroads.

For any grade separations, designers should exhaust practical options for changes to a crossing roadway/trail's grade before exploring changes to the railroad. Cost sharing for additional grade separations benefitting the broader transportation system should be negotiated among benefitting organizations, including any transit authority.

Elements of Commuter Rail runningway operations and maintenance to be addressed during planning and design include but are not limited to, integrated freight-Commuter Rail operations, safety, security, communications and central control, system compatibility, contingency planning, and periodic repairs and replacement.

5.7.3. Highway BRT Runningways

Types of Highway BRT runningways include bus-shoulder lanes and managed lanes; these lanes are dedicated or partially dedicated to public transit, accommodate public transit under all roadway conditions, and provide transit with a travel-time advantage under congested roadway conditions.

Highway BRT runningways should be full-sized lanes designed to support traffic traveling at posted speeds of 45 miles per hour or greater. Sizing Guidelines for these lanes should be as follows:

- *Full-sized Highway BRT managed lanes should be 12 feet plus buffers*
- *Full-sized Highway BRT bus-shoulder lanes should be ten to 12 feet, with ten feet being minimum, 11.5 feet being minimum on structures, and 12 feet being desirable in areas of new construction or reconstruction*

Highway BRT runningways generally should provide one lane in each direction positioned as median, curb, or "dynamic" shoulder lanes.

Highway BRT runningways may be barrier separated or indicated by surface striping, markings, color, and/or signage.

Highway BRT runningway pavement should be designed and maintained to deliver the desired ride quality.

Highway BRT runningways are lanes within freeways or other multi-lane highways designed to support traffic traveling at speeds of 45 miles per hour or greater. Highway BRT runningways include bus-shoulder lanes, like those on Cedar Avenue (Dakota CSAH 23), and managed lanes like those on I-35W South. Full-sized lanes widths do not include the width of gutters where a curbed section is used. Consistent with Project Development, Leadership, and Oversight Guidelines, the transitway lead organization is responsible for coordinating with all project stakeholders, including road authorities.

Lane dedication for Highway BRT runningways may be permanent (e.g., bus-only lanes or HOV lanes), partial (e.g., priced lanes or lanes shared with turning vehicles and/or incident management), or limited to certain hours of the day (e.g., priced dynamic shoulder lanes). Elements of Highway BRT runningway operations and maintenance to be considered during planning and design include but are not limited to, enforcement strategy, support infrastructure, snow removal, and periodic repairs and replacement.

Roadway shoulders where buses operate under congested conditions only (i.e., bus-only shoulders) are not a type of Highway BRT runningway; this approach is an operating strategy for situations where provision of or operations in a runningway is not feasible.

5.7.4. Arterial BRT Runningways

Arterial BRT generally operates in mixed traffic, but can include dedicated lanes. Arterial BRT runningways provide transit with travel-time advantages under congested roadway conditions.

Arterial BRT runningways should be full-sized lanes (10-12 feet) designed to support traffic traveling at posted speeds of less than 45 miles per hour.

Features that provide transit with a travel-time advantage include station configurations, traffic control measures, and dedicated lanes.

Where feasible, dedicated transit lanes on Arterial BRT routes typically include one lane in each direction positioned as median or curb lanes; these lanes are typically not barrier separated from general traffic lanes.

Whenever possible, Arterial BRT runningway pavement should be designed and maintained to deliver the desired ride quality.

Arterial BRT runningways are roadways designed to support traffic traveling at posted speeds of less than 45 miles per hour. Arterial BRT runningways may include any full-sized lane(s) provided to regularly accommodate public transit buses under all roadway conditions. Full-sized lanes widths do not include the width of gutters where a curbed section is used. Arterial BRT typically operates in mixed traffic but preferential features on the runningway that provide transit with a travel-time advantage will be pursued. These may include, but are not limited to:

- Station configurations including use of curb extensions and/or stations located at the far-side of intersections
- Traffic control measures including traffic signal priority and/or special traffic signal phases
- Dedicated lanes including queue jump lanes at intersections and bus lanes running with or opposite to the general traffic direction. Lane dedication may be permanent (e.g., Minneapolis Marquette and 2nd Avenues), partial (e.g., shared with turning vehicles) or limited to certain hours of the day (e.g., peak hours). Within one-way streets, BRT operates best opposite the flow of general traffic. Dedicated lanes may be designated using pavement treatments such as striping, markings, color, and/or signage.

Where Arterial BRT runningways are adjacent to a bicycle lane or recreational trail, separation should be accomplished following the guidelines of local jurisdictions, such as the Minneapolis Bike Master Plan and the St. Paul Central Corridor Bicycle and Pedestrian Plan.

Consistent with Project Development, Leadership, and Oversight Guidelines, the transitway lead organization is responsible for coordinating with all project stakeholders, including road authorities.

Elements of Arterial BRT runningway operations and maintenance to be considered during planning and design include but are not limited to, enforcement strategy, support infrastructure, snow removal, and periodic repairs and replacement.

5.7.5. Bicycle/Pedestrian Access

Transitway intersections should be designed to provide safe, efficient transitway crossings for all rail and roadway transportation modes. Special attention should be given to providing convenient and safe at-grade accommodations for pedestrians or people on bicycles crossing transitway runningways. Grade-separated bicycle/pedestrian crossings may be considered where there is no technically feasible at-grade crossing option, where benefits to the broader transportation system are shown to be significant, or where required by the runningway's owning entity (e.g., railroad).

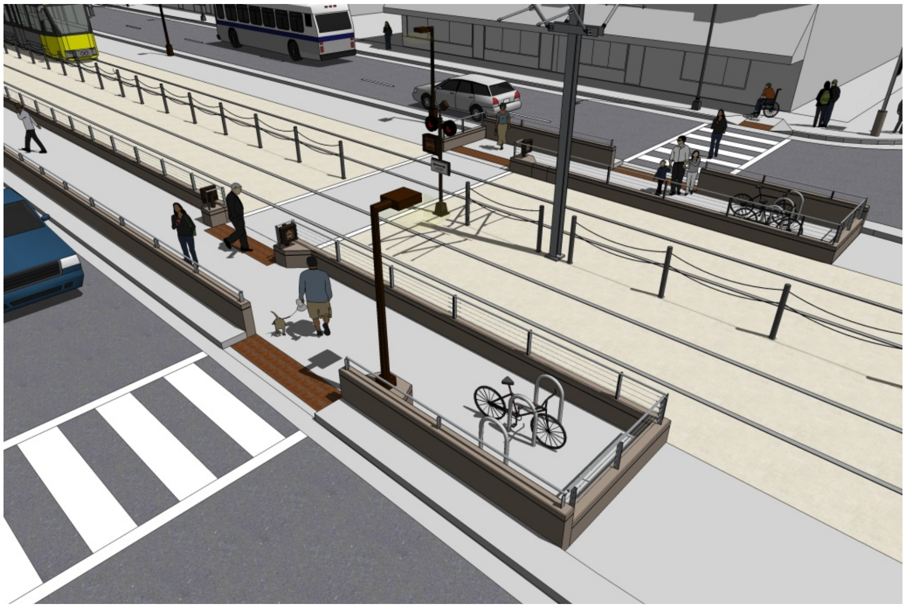
Where there is no technically feasible at-grade bicycle/pedestrian crossing option, evaluation criteria that should be considered when assessing the need for grade-separated crossings include:

- *High pedestrian volumes*
- *Long pedestrian crossing distances*
- *Presence of poor sight distance to see crossing transit patrons*
- *Roadway average daily traffic volumes of more than 35,000 and 80th percentile speeds documented at more than 40 miles per hour*
- *Distance of greater than 600-feet to the nearest alternative "safe" crossing (i.e., controlled intersection or existing under-/over-pass*
- *Potential to coordinate with adjacent facilities such as a bike trail or sidewalk system*

In general, bicycle and pedestrian crossings should be located at signalized street intersections whenever possible. Mid-block crossings between stations and street intersections should be avoided. At-grade bicycle and pedestrian crossing features may include, but are not limited to:

- Improved bicycle and pedestrian facilities such as more visible crossings using pavement treatments, colors, markings, and/or warning signals/signage; pedestrian refuge medians; roadway curb extensions; intersection countdown timers, or crosswalks with passive crossing control (e.g., "z-type" crossings proposed on University Avenue, Figure 5-5)

Figure 5-5 "Z-type" Pedestrian Crossing at Unsignalized Intersection



Source: CCLRT Project Office

- Roadway modifications such as adjusted intersection traffic signal timings, additional traffic signals, elimination of conflicting turn movements – especially free-right turn movements, and other intersection modifications that improve convenience and safety for pedestrians and bicyclists.

If an at-grade crossing is feasible, provision of a grade-separated bicycle/pedestrian crossing may be a local betterment.

6. VEHICLES

6.1. INTRODUCTION

6.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway vehicles through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the document is organized into the following main sections:

- Relevant background information including applicable laws and regional policies
- Existing conditions in the region and in other regions
- Guidelines recommended by the technical development process

6.1.2. Committee Purpose

The primary goal of the Vehicles Technical Committee was to provide guidance on bus-rapid transit (BRT) vehicles for station-to-station service in the region. The initial application of this guidance will be applied on the first Highway BRT transitways. The primary impetus for BRT vehicle guidelines relate to balance needed between vehicle styling, operational considerations, and cost.

6.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes are Arterial BRT, Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

The Vehicles Technical Committee focused its efforts on developing guidelines for BRT vehicles, specifically Arterial BRT and Highway BRT station-to-station, as existing infrastructure dictates rail vehicle types. The guidelines do not address Highway BRT express because the region has already agreed that transit providers will continue using their existing vehicles on express routes in transitway corridors. Continued use of the existing fleet for Highway BRT express allows maximum fleet flexibility for providers offering express services.

6.2. BACKGROUND INFORMATION

6.2.1. Definitions

The following section defines terms applicable to the Vehicles Guidelines.

<u>Bio-fuel</u> – Fuel derived at least in part from renewable materials, like ethanol and biodiesel.

<u>Branded vehicle</u> – A transit vehicle with a unique design or logo that helps identify it with a specific route or service provider.

<u>Hybrid-electric bus</u> – A bus that operates at times on electrical power and at times on diesel fuel. Typically, the electrical engine is powered by the energy created through braking or from power generated from the diesel engine.

<u>Regular route</u> – A transit service that operates on a predetermined, fixed route and schedule.

6.2.2. Existing Laws and Regulations

The following section summarizes the existing laws and requirements for vehicles. This section does not cover all local, state, and federal laws or regulations that are relevant to vehicles but just those relevant to the Vehicles Guidelines.

6.2.2.1. Procurement

Buy America (49 C.F.R. § 661) - Vehicles purchased using Federal Transit Administration (FTA) funding meet federal Buy America requirements if the cost of all components produced in the United States is more than 60 percent of the total vehicle cost and final assembly takes place in the United States. If either of the conditions is not met, the vehicle purchase does not meet the Buy America regulation and requires the FTA to issue a project-specific waiver.

Best Value/Low Bid (Minnesota Statutes, section 16C.28) - All state building and construction contracts entered into by or under the supervision of the commissioner of transportation or an agency for which competitive bids or proposals are required may be awarded to either of the following:

- The lowest responsible bidder, taking into considerations conformity with the specifications, terms of delivery, the purpose of which the contract is intended, the status and capability of the vendor or contractor, other considerations imposed in the call for bids, and, where appropriate, principles of life-cycle costing
- The vendor or contractor offering the best value, taking into account the specifications of the request for proposals, the price and performance criteria listed below and described in the solicitation document:
    - The quality of the vendor’s or contractor’s performance on previous projects
    - The timeliness of the vendor’s or contractor’s performance on previous projects
    - The level of customer satisfaction with the vendor’s or contractor’s performance on previous projects
    - The vendor’s or contractor’s record of performing previous projects on budget and ability to minimize cost overruns
    - The vendor’s or contractor’s ability to minimize change orders
    - The vendor’s or contractor’s ability to prepare appropriate project plans
    - The vendor’s or contractor’s technical capacities
    - The individual qualifications of the contractor’s key personnel
    - The vendor’s or contractor’s ability to assess and minimize risks

6.2.2.2. Accessibility

Title VI (49 CFR part 21) - Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color and national origin for any program that receives federal funding. Federal funding typically plays a significant role in transitway planning and development and therefore all aspects of transitway projects must comply with Title VI.

Americans with Disabilities Act (ADA) Accessibility Specifications for Transportation Vehicles (49 C.F.R. § 38) - All vehicles operated for public transportation purposes must be readily accessible to and useable by individuals with disabilities, including individuals who use wheelchairs.

6.2.2.3. Operations

Light-Rail Transit Construction and Operation (Minnesota Statutes, section 473.4051, subdivision 1) -

The Metropolitan Council will operate all LRT facilities and services located in the Twin Cities region.

Commuter Rail Operation and Maintenance (Minnesota Statutes 2008, section 473.4057, subdivision 1)

The Metropolitan Council will operate and maintain Commuter Rail facilities and services located in the Twin Cities region.

6.2.3. Existing Regional Policy and Practice

The following section summarizes the existing regional policy and practice relevant to the Vehicles Guidelines.

6.2.3.1. Fleet Management Procedure

The Metropolitan Council, in cooperation with regional transit providers, has developed a Fleet Management Procedure for providers of public transit in the region. The procedure addresses selection and purchase; maintenance, repairs, and inspections; vehicle transfer, replacement, and disposal, Council funding, vehicle identity; fleet management; vehicle equipment and ancillary items, and standard vehicle configurations. These procedures apply to all buses in the regional fleet, including transitway buses, and the Vehicles Guidelines will not address issues that are already addressed in the Fleet Management Procedure unless specified and justified.

6.2.3.2. General Fleet Practices

The general fleet practices of the transit providers in the region are assumed to be incorporated into the Guidelines assumptions for vehicles. The specific Vehicles Guidelines address only characteristics that are unique to transitway vehicles, beyond the general fleet practices of the regional transit providers.

6.3. EXISTING CONDITIONS

This section presents information about the bus fleets existing in the region, BRT fleets in other regions, and concludes by summarizing exterior and interior styling options available from manufacturers.

6.3.1. Existing Conditions in the Region

The region's existing regular-route fleet of heavy-duty buses (30-foot or greater in length) consists of a mix of manufacturers, sizes, seating configuration, number of doors, and other detailed distinctions, but there are several characteristics of the regional fleet that are consistent across all buses:

- Doors are located only on the right-side of the bus
- Wheelchair access is available on all buses through either ramps (low-floor) or lifts (high-floor)
- Bicycle storage is available for two bicycles on racks located on the outside, front of nearly all buses. Some MCI manufactured express buses may store bicycles unsecured in the luggage compartment if there is no rack.

- Diesel is the standard propulsion fuel for the fleet, whether standard, bio-fuel, or coupled with an electric hybrid-drive option

Table 6-1 presents a summary of the regional bus fleet and key characteristics are summarized below.

6.3.1.1. Bus Types

30- to 35-Foot Buses

The smaller coach-style buses are generally used for lower demand routes with peak vehicle loads that do not require the capacity of a 40-foot bus. These buses offer some savings in capital vehicle costs over larger buses, but the operating costs are typically similar to 40-foot buses operating on a comparable route. Some examples of routes utilizing these buses include the Route 87 between Highland Park in St. Paul and Rosedale Shopping Center in Roseville and the Route 805 between Northtown Mall in Blaine and the Anoka County Government Center in Anoka.

40-Foot Buses

40-foot buses are the most common-size bus in the regular-route fleet. They are used on a variety of services including local, limited stop, express, and circulator services. Buses of this size are the most flexible in terms of configuration and manufacturer options. The use characteristics of 40-foot buses (propulsion, floor height, doors, etc.) can differ across the variety of services for which these buses are deployed, even if the size remains the same. While the capital cost of 40-foot buses are higher than the 30- to 35-foot options, they do offer additional capacity and flexibility across a variety of routes.

- Low-floor – The low-floor bus is the new standard in this vehicle size and will eventually replace all high-floor buses.
- High-floor – High-floor buses may be specifically assigned to certain routes or trips that are near capacity but do not require the capacity of an articulated bus. High-floor buses generally have 4 more seats than the newer low-floor buses. Metro Transit allocates seating capacity to routes where it is needed most.
- Hybrid – Metro Transit's limited fleet of hybrid buses is currently deployed on routes that operate on Nicollet Mall in downtown Minneapolis. The Mall is the heavily traveled pedestrian spine of downtown Minneapolis with numerous outdoor restaurants and plentiful foot traffic. Hybrid buses are cleaner and quieter than standard diesel buses and these characteristics are desirable for major pedestrian-oriented areas that also have significant bus traffic.

60-Foot Articulated Buses

Articulated buses are deployed to high-demand services, including local, limited stop, and express. High-floor and low-floor buses are sometimes deployed to meet specific service characteristics, similar to the 40-foot buses. There are currently no hybrid articulated buses in the region, although the technology is available and used in other regions throughout the country.

- Low-floor – Low-floor articulated buses, the new standard fleet, are focused on high-demand urban routes such as the 3, 16, and 50. These routes typically have more frequent boardings and alightings since passenger trips are shorter and the low-floor buses offer easier boarding/alighting for the user.
- High-floor – High-floor articulated buses are focused on high-demand express routes, where seating capacity is more important (longer passenger trips) and boarding and alighting is less frequent than local routes.

45-Foot Coach Buses

Commuter coach buses are high-capacity vehicles with some amenities focused toward longer trips. The use of commuter coach buses is limited, however, by the number of doors and aisle width, which makes them poorly suited for trips with significant turnover of the seats along the route. These buses are used in the region exclusively for express services and typically serve the longer-distance express trips where demand warrants the increased capacity. The capital cost of commuter coach buses generally falls between 40-foot (non-hybrid) and 60-foot articulated buses.

6.3.1.2. Doors

One-door Buses

Some bus types are operated in this region with only a front door. The 30- and 35-foot models are generally only available with one-door because the second door reduces the already limited seating capacity and the lower demand for these services creates less turnover. Some 40-foot buses and all 45-foot coach buses also have only a front door. These buses serve express markets where turnover is low and seating is in high demand.

Two-door Buses

The majority of 40-foot and 60-foot articulated buses in the fleet have two doors. On local service, the front door is used for both boarding and alighting and the rear door is primarily used for alighting. On some express services (pay as you exit), the rear door is used for boarding and the front door is used for boarding and alighting.

Three-door Buses

The University of Minnesota is the only provider in the region operating buses with more than two doors. These buses are deployed on circulator-type services where demand is high and trips are short. The multiple doors provides for faster boarding and alighting at stops. Since no fares are collected on these buses, all doors can be used for both boarding and alighting. These buses were also purchased without the use of FTA funding and are not compliant with Buy America rules.

Table 6-1 – Existing Regional Bus Fleet Summary

Manufacturer	Gillig	Gillig	Gillig	New Flyer	New Flyer	New Flyer	MCI	Van Hool (*Not Buy America Compliant)*
Length	30’	40’	40’ Low-Floor Hybrid	35’ Low-Floor	40’ Low-Floor	60’ Articulated Low-Floor	Coach	40’ Low-Floor
Operator	Other Providers	Metro Transit, other providers	Metro Transit	Other providers	Metro Transit	Metro Transit	Metro Transit, other providers	U of MN
Floor	High	High and Low	Low	Low	Low	High and Low	High	Low
Years	2002	1991-2010	2002-2010	2002	2003-2006	1998-2009	1998-2009	2009
Quantity	14	615 HF 166 LF	69	6	68	120 HF 46 LF	102	16
Seats	25-29	42-45 HF 36-40 LF	35-39	29	38-42	66-68 HF 58-62 LF	57	42 (all seats deployed)
Standing	15	15-26		11	20		21-Dec	33 (seats not deployed)
Propulsion	Diesel	Diesel	Diesel Hybrid-Electric	Diesel	Diesel	Diesel	Diesel	Diesel
Doors	1	2	2	1	1-2	2	1	3
Bike Storage	Off-board (2)	Off-board (2)	Off-board (2)	Off-board (2)	Off-board (2)	Off-board (2)	Off-board (2)	Off-board (2)
Est. Price (2010)1		$398,000	$571,000			$680,000	$525,000	

[1] Cost escalated to 2010 dollars based on Producer Price Index, Buses (PCU3361203361203)

6.3.2. Existing Conditions in Other Regions

There are a number of regions around the United States that have implemented BRT services that resemble the services proposed in the Twin Cities region. Table 6-2 summarizes existing BRT vehicle conditions in other regions and the text below discusses key trends and conclusions.

6.3.2.1. Manufacturers

The majority of BRT systems implemented in the United States utilize vehicles manufactured to meet Buy America regulations. Most BRT systems use some FTA funding to purchase buses and a Buy America waiver is a significant barrier to go outside of that requirement. Las Vegas and Salt Lake City were able to purchase European-made buses by utilizing only local funding sources. Section 6.3.3 summarizes the vehicles that are presently available from American manufacturers that offer some unique BRT features.

6.3.2.2. Length

The majority of the BRT fleets reviewed utilized either 40-foot or 60-foot vehicles. Many factors play into determining the vehicle size for a corridor. These factors include peak passenger loads, average passenger trip length, and headways. The interior configuration of a vehicle (driven by the previous characteristics) had a significant effect on the length needed to meet demand. Some vehicles serving high-demand corridors, such as Cleveland's HealthLine, utilize a longer vehicle despite providing about the same seating capacity as a standard 40-foot vehicle (47 seats on a 60-foot New Flyer BRT in Cleveland as compared to 38 seats on a low-floor Gillig from Metro Transit). These high-demand corridors generally serve shorter trips where customers prefer to stand. Vehicle length is a function of both seating and standing capacity and is a driving factor in vehicle capital cost.

6.3.2.3. Styling

The BRT fleets surveyed illustrate multiple ways to distinguish a BRT line from a standard bus line. One way these regions have distinguished between the lines is through vehicle styling. Results of the review indicate that most BRT corridors have buses that include some sleeker, more modern-looking styling to distinguish them from the other buses in system. There are varying degrees of "sleek" and "modern", ranging from enhanced roof fairings to rail-like vehicles. The trade-offs between these different styling packages include costs (capital and operating), functionality, parts availability, and interoperability. The cost differences can be significant, as evidenced by the varying costs per vehicle in the systems, but these results indicate that a higher level of BRT vehicle investment over is common in other regions.

6.3.2.4. Bicycle Storage

Bicycle storage on BRT buses is often similar to that of other buses within a region. In some instances, bicycles are simply not allowed on buses because of capacity constraints and safety issues. Some providers have bicycles storage inside the vehicle when coupled with the capacity of an articulated vehicle, off-board fare collection, and multiple-door boarding. The remaining providers allow bicycles storage on racks mounted on the outside front of vehicles.

6.3.2.5. Seating and Standing Capacity

Survey results illustrate that seating and standing capacity varies from 39 seated on Kansas City MAX buses to the Cleveland HealthLine buses, which seat 47 customers and accommodate an additional 53 customers standing. Survey results demonstrate that seating and standing capacity is dependent on several factors including bus length, wheelchair and bicycle storage locations, aisle width, and other interior configuration options. Larger vehicles are able to house more seats, but in some instances, a 40-foot bus focused on maximizing seating capacity can have as many seats as a 60-foot bus focused on maximizing features and standing space within the bus. Survey results demonstrate that the seating and standing capacity required, much like vehicle length, is dependent on passenger demand, trip length, and service characteristics (speed and runningway).

6.3.2.6. Cost

Bus costs for BRT systems vary significantly, but they can best be summarized by similar sizes and propulsion. For the purposes of this analysis, bus costs provided by other regions were inflated to 2010 costs when necessary based on the Producer Price Index for large bus and truck vehicles.

40-foot Diesel or Hybrid

Costs in other regions ranged from $384,000 to $469,000 (2010 dollars) for 40-foot BRT-style diesel buses. Comparably, the most recent figures from Metro Transit are $398,000 in 2010 for a diesel bus and $571,000 for a hybrid bus. New Metro Transit Gillig buses already incorporate some BRT styling features into their standard fleet, which makes styling comparisons difficult. These results demonstrate a nearly negligible cost difference for BRT styling alone, but hybrid propulsion adds approximately 40 percent to the cost of a 40-foot bus.

60-foot Diesel or Compressed Natural Gas (CNG)

Costs in other regions ranged from $817,000 to $916,000 (2010 dollars) for 60-foot diesel or CNG BRT-style buses. Comparably, the most recent figure from Metro Transit is $680,000 in 2010 for a non-BRT styled diesel bus. BRT buses of this type cost 20 to 33 percent more than a comparable standard Metro Transit bus.

60-foot Hybrid

Costs in other regions ranged from $1,143,000 to $1,465,000 (2010 dollars) for 60-foot hybrid BRT-style buses. Comparably, Metro Transit’s 60-foot non-BRT styled diesel bus costs $680,000 with a hybrid estimated to cost from $870,000 to $930,000. The 60-foot hybrid BRT buses would represent at least a 25 percent increase over a standard 60-foot hybrid bus and as much as 60 percent.

Table 6-2 – Other Bus-Rapid Transit Fleet Summary

	Cleveland *HealthLine*	Eugene *EmX*	Los Angeles *Orange Line*	Los Angeles *Metro Rapid*	Kansas City *MAX*	Boston *Silver Line*	NYC *SelectBus*	Las Vegas *MAX*	Salt Lake City *MAX*
Bus Manuf.	New Flyer	New Flyer	NABI	NABI & New Flyer	Gillig	Neoplan USA	Nova	Civis	Van Hool
Bus Length	60’	60’	60’ & 65’	40’, 45’ & 60’	40’	60’	60’	60’	40’
Bus Styling	Sleek Wheel Covers	Sleek Wheel Covers	Sleek Wheel Covers	Varies	Sleek	Regular/Old	Regular/Old New Coming	Light-Rail-Like	Sleek
Propulsion	Hybrid	Hybrid	CNG	CNG	Hybrid	Electric (w/diesel) & CNG		Hybrid	Diesel
Bicycle Storage	Stdg. room only	On-board (3)	Off-board (2)	Off-board (2)	Off-board (2)	None	None	On-board (2)	Off-board (2)
Seating	47 seated 53 standing	44 seated 56 standing	57 seated	Varies	39 seated	57 seated 22 standing	Up to 62		36 seated 26 standing
Doors	3 (at least)	5	3	Varies	2	3	3	4	3
Aisle Width	Std.	Std.	Wide	Std.	Wide	Std.	Std.	Wide	Wide
Level Boarding	Yes	Yes	Yes	Yes	No	No	No	Yes	No
Fare Collection	Off-board	Off-board	Off-board	On-board	On-board	On-board & Off-board	Off-board	Off-board	Off-board
Non-Std Fleet	Yes	Yes	Yes	Some	Yes	Yes	Yes	Yes	Yes
Per Vehicle Cost	$1,060,000 (2006)	$960,000 (2003)	$734,000 (2007)	Varies	$323,000 (2004)	$770,000 (2003)		$1,230,000 (2003)	$430,000 (2008)
2010 Vehicle Cost[2]	$1,194,000	$1,143,000	$817,000	Varies	$384,000	$916,000		$1,465,000	$469,000

[2] Cost escalated to 2010 dollars based on Producer Price Index, Buses (PCU3361203361203)

6.3.3. Bus Styling Options from Manufacturers

6.3.3.1. Exterior Styling from American Manufacturers

The Vehicles technical committee reviewed styling options available from the four major manufacturers in the United States: Gillig, New Flyer, North American Bus Industries (NABI), and Nova Bus. Figure 6-1, Figure 6-2, Figure 6-3, and Figure 6-4 illustrate examples of the different vehicle exterior styling options presently available. The committee noted that while there are differences between the available options, all manufacturers offer BRT styling that is different from the standard buses presently in use in the region. The committee also noted providers use paint schemes to distinguish BRT vehicles from the standard fleet.

Figure 6-1 – Gillig Exterior Bus Styling Options

LEFT: Regular Fleet 40' – Metro Transit; RIGHT: BRT Style 40' – Kansas City, MO

Figure 6-2 – New Flyer Exterior Bus Styling Options

TOP LEFT: Regular Fleet 40' – Tri-Met, OR; TOP RIGHT: BRT Style 40' – Excelsior Model; BOTTOM LEFT: BRT Style 40' – Other

LEFT: Regular Fleet 60' – Cleveland, OH; RIGHT: BRT Style 60' – Community Transit, WA

Figure 6-3 – Nova Bus Exterior Bus Styling Options

Regular Fleet – LFS Demonstration Model

TOP: Regular Fleet 60' – New York MTA, LFS; BOTTOM: BRT Style 60' – LFX Model

Figure 6-4 – NABI Exterior Bus Styling Options

LEFT: Regular Fleet 40' – Las Vegas RTC; RIGHT: BRT Style 40' – Demo Bus

BRT Style 60' – D.C. Metro

6.3.3.2. Interior Styling and Feel

There are a number of ways the interior of a vehicle can be organized and styled to provide a different feel for the user. Figure 6-6 through Figure 6-12 present different styling options for buses and light-rail vehicles (LRVs) that illustrate how the organization, color scheme, and lighting of a vehicle can affect the interior feel.

Express-Style 40' Bus Interior

Figure 6-5 is a Mountain Metro Suburban 40' Low Floor, which is an example of a bus maximized for seating capacity and longer travel trips. There is less open interior space, the aisles are narrower, and the lighting is dimmer.

Figure 6-5 – Mountain Metro Suburban 40' Low-Floor Bus

Urban-Style 40' Bus Interior

Figure 6-6 is a Metro Transit 40' Hybrid Low Floor, which is an example of a bus utilized for urban routes with higher passenger turnover. There is more open space, wider aisles for passenger movement, and a lighter feel to the interior.

Figure 6-6 – Metro Transit 40' Hybrid Low-Floor Interior

Bus-Rapid Transit Vehicle Interior

There are different configurations for the interior of BRT vehicles. Figure 6-7 and Figure 6-8 illustrate two examples. Figure 6-7 is a Los Angeles Orange Line bus, which is 60 feet in length, has three doors, has a greater number of stanchions for standees, and has large windows. Figure 6-8 is a New Flyer 40' Excelsior Demonstration bus. This bus has wider aisles, bright lighting, and clearly identified transition features (bright orange stanchions, bright yellow steps, etc.). Figure 6-9 is an example of a different configuration of seating that creates more space for movement inside a vehicle.

Figure 6-7 – Los Angeles Orange Line BRT Vehicle Interior

Figure 6-8 – New Flyer 40' Excelsior Demonstration BRT Vehicle Interior

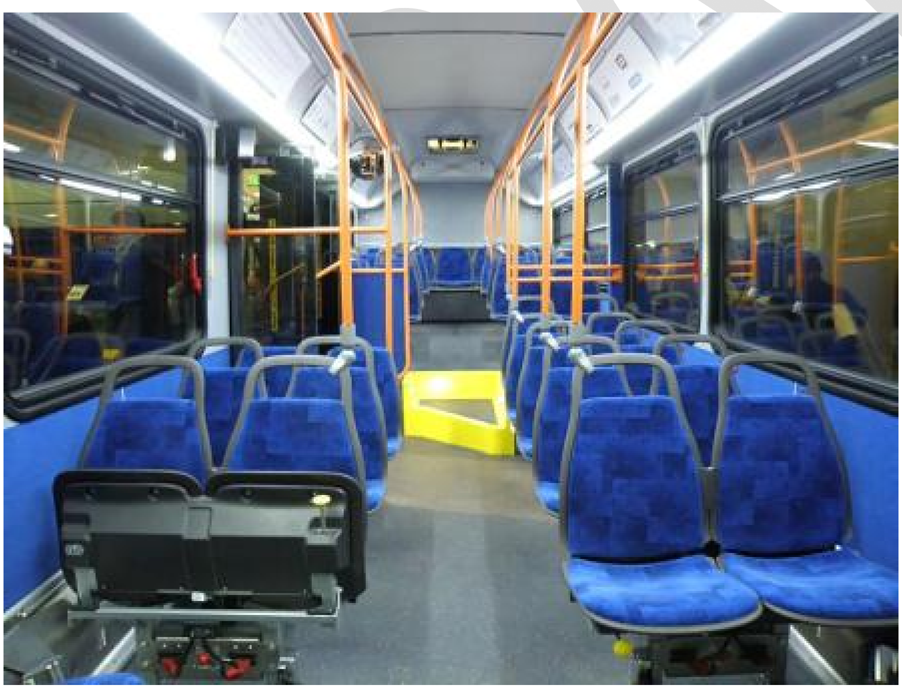


Figure 6-9 – Kansas City MAX 40' Low-floor BRT Vehicle Interior

Light-Rail Vehicle (LRV) Interior

There are different configurations for the interior of light-rail vehicles (LRV). Figure 6-10, Figure 6-11, and Figure 6-12 illustrate three examples. Figure 6-10 is a Hiawatha LRV interior, Figure 6-11 is a Denver RTD LRV interior, and Figure 6-12 is a Houston Metro LRV interior. These figures illustrate the brighter, spacious interiors of LRVs with wider seats, wider aisles, and higher ceilings. These characteristics create a more open feeling inside the vehicles than standard bus fleets.

Figure 6-10 – Hiawatha LRV Interior Configuration

Figure 6-11 – Denver RTD LRV Interior

Figure 6-12 – Houston Metro LRV Interior

From these images, important factors in the more open feel of LRVs can be identified to include:

- Aisle width
- Seating row width
- Seat width
- Seating arrangement
- Window size
- Window color
- Lighting type and placement
- Interior color scheme and materials

6.3.4. Journal of Public Transportation Abstract Summary

The Journal of Public Transportation published an abstract on BRT vehicle selection in 2004[3], which drew from past case studies and made conclusions about BRT vehicle selection. The abstract recognized many considerations when determining the vehicle for a BRT service, including:

- Capacity and external dimensions
- Interior configuration
- Doors

[3] Zimmerman, S. L., Levinson, H. (2004). Vehicle Selection for BRT: Issues and Options. *Journal of Public Transportation*, Vol. 7, No. 1, 83-103.

- Floor height
- Propulsion systems
- Guidance
- Aesthetics, identity and branding

The abstract concludes with general guidelines to be considered during BRT system planning and project development. The conclusions identify the importance of planning for vehicles that:

- Are designed to match the markets and services to be offered
- Provide sufficient capacity
- Provide high passenger appeal through amenities and unique features
- Are easy and rapid to board and alight
- Are configured to match seating and standee needs and allow for easy internal circulation
- Are proven in revenue service
- Are uniquely identifiable to users

The conclusions in this abstract, which were based on extensive research and case studies, and the information existing conditions in this region and peer regions, provide the background for recommendations in Section 6.4.

6.4. VEHICLES GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff, the following Vehicles Guidelines are recommended for adoption. It is important to note that these guidelines are not meant to be overly prescriptive, but rather provide a basis for understanding the elements important to vehicle decision making in an industry where technology, styling, and vendors are evolving quickly. The guidelines should be considered collective when making vehicle decisions for transitways. The guidelines are summarized and discussed below.

6.4.1. Light-Rail (LRT) and Commuter Rail Vehicles

The vehicles for LRT and Commuter Rail must be compatible with the existing rail and infrastructure systems.

Under current operating legislation, the Metropolitan Council will operate all rail lines in the Twin Cities; it currently operates the Hiawatha LRT line and Northstar Commuter Rail line. Future vehicle purchases will consider compatibility with the existing rail and infrastructure systems as the factor of utmost importance.

6.4.2. Vehicle Sizing and Capacity Requirements

When determining the vehicle sizing and seating requirements for BRT station-to-station service, it is important to consider the service type and characteristics. Important considerations should include at a minimum:

- *Passenger load standards/peak loads*
- *Passenger trip lengths (time and distance)*
- *Ridership demand at end of vehicle life*
- *Service characteristics (speed, maneuvering)*
- *Interior organization of vehicle features such as seats, wheelchair securements, fare-collection equipment, and bicycles*

This guideline is a tool for bus-rapid transit (BRT) planners and implementers to understand the important considerations when sizing and configuring a vehicle for BRT station-to-station service. There is no “ideal” BRT vehicle that will fit the needs of every corridor in the region. In addition, a guideline recommending a specific vehicle configuration would limit the flexibility of those vehicles for use on other corridors or as characteristics of the corridor change.

Table 6-3 summarizes vehicle types and their passenger loads and appropriate service types. BRT station-to-station vehicles would match with options associated with local service but a more detailed analysis of service type using the considerations listed above should be done in addition to the policy provided below.

Vehicle type should be determined and purchased according to service types and passenger loads. Interlined and start-up services may provide exceptions.

Table 6-3 – Metropolitan Council Fleet Management Procedure: Vehicle Type Determination Chart

Vehicle Type	Passenger Loads*	Service Type	Minimum Vehicle Life
Commuter Coach	Min: 30 Max: 57	Express with a one-way trip length greater than 15 miles AND duration greater than 30 minutes	12–14 years**
Articulated Diesel Transit Bus	Min: 30 Max: 58 (Express) Max: 73 (Urban Local)	Express, Local	12 years
Articulated Hybrid Transit Bus	Min: 44 Max: 73	Local	12 years
40’ Hybrid Transit Bus	Min: 29 Max: 48	Local	12 years
40’ Diesel Transit Bus	Min: 20 Max: 38 (Express) Max: 48 (Local)	Express, Local	12 years
30’ Transit Bus	Min: 13 Max: 26	Medium-Volume Local; Low-Volume Express	12 years

*Peak loading pattern
**APTA Peer Review in 2011 will refine vehicle life.

6.4.3. Passenger Boarding

Vehicle boarding on BRT service should be as quick and convenient as possible for all passengers. Important considerations should include at a minimum:

- *Location of wheelchair access and type of securement*
- *Location and quantity of bicycle storage*
- *Boarding demand at each station*
- *Opportunity for level boarding*
- *Door number and width*
- *Fare-collection technology (on-board or off-board)*
- *Interior organization of seating and other features*

The disability community prefers the wheelchair securements to be as close to the wheelchair-loading door and as easily navigable as possible. In addition, wheelchair securement technology is rapidly changing, increasing the speed and ease of boarding for passengers using wheelchairs, and innovation should be explored for transitway vehicles. The same concepts apply to bicycle storage, but it is also important to ensure that bicycles do not interfere with other passenger movements and do not negatively affect the ability to serve demand for space in the vehicle. Other region examples exhibit the need for multiple-door boarding and off-board fare collection, and the need for space provided by an articulated bus when considering on-board bicycle storage.

Passenger boarding speed and convenience is related to the demand at each station. Boarding at low-demand stations may be quick and convenient with limited improvements over existing service while higher-demand stations may require additional amenities to improve boarding speeds (such as multiple-door boarding or wider doors). The organization of seating and interior features and opportunity for level boarding also affects the passenger boarding process.

6.4.4. Customer Comfort and Safety

BRT station-to-station vehicles should create an open and comfortable feeling inside similar to light-rail vehicles in the region. Important considerations should include at a minimum:

- *Natural and artificial lighting*
- *Window size, number, type, tint*
- *Color scheme*
- *Seating arrangement and style*
- *Opportunity for off-board fare collection*

BRT station-to-station vehicles should feel similar to light-rail vehicles (LRVs) in the interior. The level of investment in these corridors warrants a higher-quality design inside vehicles with improved, distinctive features, and a distinctive feel. For example, LRVs use fixed windows that do not open and the interior is climate-controlled at all times. This approach reduces interior noise and provides a consistent climate for passengers in the vehicles.

6.4.5. Interior and Exterior Styling

The exterior and interior of BRT vehicles should portray the sleek, modern, and premium experience of BRT station-to-station service. This can be accomplished through a combination of styling and branding/paint scheme options.

The styling of both the interior and exterior of BRT vehicles is closely tied to the aesthetics at a snapshot in time and the identity and branding of the vehicle. As vehicle technology evolves at a rapid pace, it would be difficult to maintain a distinctively more modern look for vehicles operating BRT service over other vehicles in the regional fleet. In many cases, regional providers are already operating BRT-style vehicles on regular bus service. In order to maintain a distinctive look, BRT vehicles should portray the characteristics of the service using a combination of styling options that are available at the time of purchase and branding/paint schemes developed for the service.

6.4.6. Interior Noise

BRT station-to-station vehicles should strive to achieve interior noise levels as similar to LRT as possible. Primary sources of interior noise from buses include heating, ventilating, and air conditioning systems, fare-collection equipment, door and window build type, overall build quality, and engine noise.

Vehicle-related noise levels inside LRT vehicles are lower than those inside buses in the regional transit fleet. Much of the noise inside buses comes from the engine, mechanical components (HVAC, fare box), and wind noise from open or leaky windows and doors. LRVs have less engine noise, fewer mechanical components, and more secure doors and windows. The rail guideway for LRT is also a contributing factor behind the reduced interior vehicle noise, but the quality of the ride for BRT as it relates to guideway is often outside the scope of the vehicle specifications.

6.4.7. Feature Integration

Features of the BRT station-to-station vehicles (customer information technology, security systems, etc.) should be integrated into the design of the bus as much as possible.

Outfitting BRT vehicles with technology that is integrated into the original design of the vehicle rather than becoming a post-delivery add-on is important. This requires the technology features of a vehicle to be known and clearly articulated during the design of the original specifications. When technology features are integrated into the design of the vehicle, this illustrates to the public that technology and customer information are important components of the service and create a premium feel, similar to LRT.

6.4.8. Propulsion Technology

BRT vehicle propulsion should be assessed on an individual basis for each transitway and vehicle purchased for the transitway in the region. Important considerations for this assessment include:

- *Compatibility with existing support infrastructure and staff expertise*
- *Life-cycle cost of propulsion technology and associated operating costs (including any costs for associated support facilities)*
- *Operating characteristics of service*
- *Externalities such as affect on environment, land uses immediately adjacent to transitway, and noise*

The analysis of vehicles in this region and other regions illustrated that propulsion technology has a significant effect on vehicle capital costs. The technology can also have a significant effect on support infrastructure and maintenance and operator staff training, as well. Depending on the service characteristics, hybrid technology can reduce fuel consumption and have an effect on operating costs. There can also be environmental and perception benefits associated with hybrid vehicle technology. However, standard diesel propulsion technology is becoming cleaner, quieter, and more efficient than ever before. It is impossible to determine where propulsion technologies will be in the future and it is difficult to recommend a one-size-fits-all technology for BRT transitways around the region. Thus, the recommendation is to do an analysis of different considerations related to vehicle propulsion for each implementation of BRT vehicles, also taking into account less technical considerations such as the availability of funding and local political support.

6.4.9. Cost Considerations

Cost assumptions for BRT station-to-station vehicle purchases should be developed collaboratively, with parties responsible for the following at a minimum:

- *Transitway development*
- *Initial vehicle funding*
- *Vehicle procurement, operations, repair, and replacement*

These cost assumptions should be developed early in the transitway planning process and collaboratively revisited as the transitway progresses through development.

Vehicles may also include opportunities for additional enhancements over and above collaboratively agreed upon vehicle designs. The desire to include such enhancements, called local betterments, should be coordinated with above-mentioned parties in the earliest stage of the development process. Early coordination should include the local entity requesting the betterment and specific discussion about commitments to fund the incremental costs of the betterment, including any other associated incremental costs such as facility needs, ongoing repair and maintenance, training, and/or replacement.

Technical information and regional expertise verified the wide range of factors that affect vehicle costs including: propulsion technology, styling options, availability of replacement parts, order quantity, testing requirements, procurement timeline, warranty information, customization options for component feature selection, evolving technology, fleet integration, and emission standards. Given the uncertainty of many of these factors for the BRT fleet, it is difficult to identify specific cost guidelines for BRT vehicles. Instead, it is recommended that the discussion about vehicle costs be a collaborative effort between the primary stakeholders to identify vehicle options that align with the Transitway Guidelines and are acceptable to the stakeholders.

Similarly, if the stakeholders cannot come to consensus on an acceptable vehicle for all, local betterments may need to be addressed early in the transitway process. Vehicle betterments can have significant effects on other transitway components and may need to be coordinated with other betterments, as determined by the collaborative partners.

6.4.10. Vehicle Integration and Compatibility

BRT station-to-station vehicles do not need to be integrated with the standard fleet and branding schemes may preclude the use of standard fleet vehicles on BRT transitways for daily BRT operations. To the extent possible, BRT station-to-station vehicles should be compatible across transitways for ease of through-routing, potential cost savings, and flexibility in reallocating vehicles with changing service plans and passenger loads.

No recommendations are made requiring that BRT vehicles be the same as the regular fleet because it is too restrictive and would limit the branding options to distinguish the vehicle.

7. FARE-COLLECTION SYSTEMS

7.1. INTRODUCTION

7.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway fare collection systems through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the remainder of this document is organized into the following sections:

- Relevant background information including applicable laws and regional policies
- Existing conditions in the region and in other regions
- Guidelines recommended through the technical development process

7.1.2. Committee Purpose

The purpose of the Fare Collection Systems Technical Committee was to draft guidelines for use in proposing new fare collection systems for transitways. These guidelines are meant to help lead organizations understand the strengths of the region's existing fare collection system and other key factors, including capital and ongoing operating costs, which should be considered when proposing new systems to the Metropolitan Council, the organization that coordinates and makes all policy decisions regarding transit fare collection in the Twin Cities region. These guidelines will promote a transitway's ability to provide competitive, reliable travel times and predictable experiences while meeting the regulatory and fiduciary requirements associated with transit fare collection.

Regional transit fare policy is not within the scope of this Fare Collection Systems Technical Committee as it is one of the responsibilities of the Metropolitan Council. The Fare Collection Systems Technical Committee anticipated fare policy changes may happen in the future and attempted to develop the guidelines to support technical implementation of any such changes.

7.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the Fare Collection Systems Technical Committee discussion include Arterial Bus-Rapid Transit (BRT), Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

7.2. BACKGROUND INFORMATION

7.2.1. Definitions

The following section defines terms applicable to the Fare Collection Systems Guidelines.

Contactless smartcard or smart card – A media used for fare collection for a transit trip utilizing an embedded computer chip in a plastic or paper card for near field communications. Near field communications is a short-range, high-frequency wireless communication technology that enables the exchange of data between devices over about a ten-centimeter (around four-inches) distance. The use of near field communications with these cars allows customers to pay their fare and have it stored on their contactless smart card. They then are able to simply hold their card near a card reader to pay for their trip and for the system to register their trip activity. The Twin Cities region's contactless smart cards are presently named Go-To Cards.

Coupon – A means of fare collection for a transit trip using a paper coupon that the customer inserts in the farebox or ticket vending machine to pay for their trip and register their trip.

Fare – The price charged to transport a person on a transit vehicle.

Fare collection – The process of collecting a fare for a transit trip.

Fare collection system – The process used to sell, distribute, collect, and validate transit passenger fares, including media, devices, computer hardware and software, procedures, reconciliations and controls.

Fare media – The medium used to convey payment of a transit passenger fare (i.e. smart cards, tokens, coupons, tickets, etc).

Fare payment – The transaction of providing payment for a ride or multiple ride pass. Payment options in the region presently include pre-payment (payment prior to boarding) via contactless smart card (Go-To Card, Metropass, College Pass, UPass, and Student Pass), via magnetic stripe cards (SuperSaver Stored Value Card, Super Saver 31-day Pass, Day Pass, Event 6-Hour Pass, Northstar Roundtrip Family Pass), and others. A new 7-day pass was implemented in the 4th quarter of 2010.

Fare validation – The process of confirming the legitimacy of a transit passenger fare. Currently fares are validated via farebox/driver observation on busses or via officer inspection in the case of LRT or Commuter Rail.

Magnetic stripe card or ticket – A media used for fare collection for a transit trip using a card or ticket with a magnetic stripe. The customer inserts into a fare box reader on the bus to pay for their trip and for the system to register their trip (card and ticket). Trip activity and card/ticket value are printed on the card when validated. The region's magnetic stripe cards are presently named "SuperSaver" cards, and magnetic stripe tickets are issued by LRT and Commuter Rail ticket vending machines. Ticket vending machines print the card detail on the ticket in addition to encoding on the magnetic strip. On LRT and Commuter Rail, the officer will visually inspect the ticket as there is no magnetic card reader used in the rail systems.

Token – A medium of fare collection for a transit trip using a specialized token similar to a coin that the customer feeds into a fare box to pay for and register their trip. Tokens may also be used in ticket vending machines to purchase a ticket.

7.2.2. Existing Laws and Regulations

The following section summarizes the existing laws and requirements that are relevant to the Fare Collection Systems Guidelines.

Title VI – Level and quality of transportation service should be provided without regard for race, color, national origin (including proficiency with English), or level of income.

Americans with Disabilities Act (ADA) Accessibility Specifications for Transportation Vehicles (49 C.F.R. § 38) – All vehicles operated for public transportation purposes must be readily accessible to and useable by individuals with disabilities, including individuals who use wheelchairs.

Federal Transit Administration (FTA) ridership reporting requirements – The FTA requires 100 percent counts, if available and reliable, of unlinked passenger trips (UPT). Unlinked passenger trips are the number of passengers who board public transportation vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination. The current practice for obtaining these counts in the region is through fare collection data.

7.2.3. Existing Regional Policy

The following section summarizes the existing regional policy that is relevant to the Fare Collection Systems Guidelines.

Regional transit fare policy[1] – The Metropolitan Council is responsible for implementing the transit fare policy for all transit services within the seven-county metro area. The fare structure as of January 2011 is summarized in Table 7-1 and Table 7-2.

Table 7-1 Regional Fare Structure for Buses and Light Rail

Base Fare is $1.75			
Rush Hour Fares		**Non-Rush Hour Fares**	
	Fare		**Fare**
Local	$ 2.25	Local	$ 1.75
Express	$ 3.00	Express	$ 2.25
Reduced		**Reduced**	
Youth (5 and Under)	Free	Youth (5 and Under)	Free
Youth (age 6 to 17)	Full Fare	Youth (6-12)	$ 0.75
Seniors (65+)	Full Fare	Youth (13-17)	Full Fare
Medicare	Full Fare	Seniors (65+)	$ 0.75
		Medicare	$ 0.75
Mobility	$ 0.75	Mobility	$ 0.75
Downtown Zone	$ 0.50	Downtown Zone	$ 0.50
Roundtrip Downtown Zone (LRT Only)	$ 1.00	Roundtrip Downtown Zone (LRT Only)	$ 1.00

1 Sources: Guidelines & Procedures for Metro Transit. Regional Transit Providers Fare Collection System document. [Metropolitan] Council-wide Policy and Procedures. Metro Transit Web Site.

Table 7-2 Regional Fare Structure for Commuter Rail

	WEEKDAY	WEEKEND		Family Pass
One-way fares to / from downtown Minneapolis	All customers except persons with disabilities	Adults	Seniors (65+), Youth (6-12) and Medicare card holders. *Valid at all times for persons with disabilities.*	Two adults and up to three kids age 6-17 *Available from ticket vending machines at suburban stations after 9am and valid from time of purchase until midnight of the same day.*
Big Lake	$7.00	$5.25	$1.75	$17.00
Elk River	$5.50	$4.00	$1.25	$13.00
Anoka	$4.00	$3.00	$1.00	$10.00
Coon Rapids - Riverside	$3.25	$3.00	$1.00	$10.00
Fridley	$3.25	$2.50	$0.75	$8.00
Station-to-Station	$3.25	$2.50	$0.75	NA

The regional fare policy defines rush-hour service as transit service that is in effect between 6:00am and 9:00am and from 3:00pm to 6:30pm Monday through Friday, except Metro Transit recognized holidays and reduced service days. There are no rush-hour fares for Northstar trains.

The regional fare policy also identifies six groups that are eligible for discounted transit service. These groups include: youth, seniors, Medicare cardholders, persons with disabilities, disabled veterans, and passengers traveling solely in the identified downtown zone. A summary of the discount policies associated with each are summarized below.

Youth – The rate of the reduced fare is dependent of the service type and age of the customer. Youth age 5 and under ride free when accompanied by a paid fare or approved free ride (up to 3 per fare). Youth ages 6-12 are eligible for a reduced fare during non-rush hours but must pay the full fare on rush-hour services. Persons age 13-17 are considered to be young adults and must pay the full adult fare at all times. However, persons age 17 and under may qualify for reduced fares through their school or employer.

Seniors – Persons age 65 and older and considered seniors and are eligible for a reduced transit fare on non-rush-hour service with proper identification. Proper identification includes: A Minnesota Driver’s License with a “T” endorsement, State ID card with a “T” endorsement, or railroad retirement card.

Medicare cardholders – Medicare cardholders are eligible for reduced transit fares during non-rush hours only and with proper identification. Proper identification includes: A Minnesota Driver’s License or State ID card.

Persons with disabilities – Persons may be eligible for a reduced fare if they have a permanent or temporary disability that prevents them from using regular-route transit as efficiently as a customer without a disability. Persons with limited mobility are eligible to ride transit with a reduced fare regardless of the travel time if they have the proper identification. Proper identification includes: Metro Mobility Card or transfer, Minnesota Operator's License/State ID with an "L" or "A" endorsement, or Metro Transit temporary ID card accompanied by a picture ID. Additionally, a personal care attendant may ride for free when a person qualified for a mobility fare pays their fare and presents the appropriate identification.

Disabled veterans – Disabled veterans are eligible to ride free regardless of the travel time if they have proper identification. Proper identification includes: a Veterans Identification Card issued by a VA Medical Center with the words "Service Connected" or "SC" below the photo.

Downtown zone – Persons travelling solely within the identified downtown zone are eligible for a reduced fare of 50 cents for that trip. The reduced fare covers only one trip and no transfers are included with the downtown zone fare. Unless otherwise noted, all transfers expire 2.5 hours after issue.

The regional fare policy also includes policies related to fare transfers. A transfer is issued to a fare-paying customer at no additional charge and may be used on any regional provider fixed-route service bus or LRT trip in any direction for an equivalent fare until expiration. Currently the transfer is good for 2 ½ hours. The transfer is not transferrable.

Changes to the regional transit fare policy are governed by the Council-wide Policy and Procedures *(Section 3-2-6 Transit Fare Policy Changes and section 3-2-6a Implementing Procedure)*. There are two types of fare policy changes: (1) permanent changes to the fare tariff and (2) temporary changes to the fare tariff lasting less than 12 months. Proposed permanent fare increases or decreases are subject to the public hearing process whereas, proposed temporary fare changes do not require approval by the Metropolitan Council.

7.3. EXISTING CONDITIONS

7.3.1. Existing Conditions for Fare Collection in the Region

Metro Transit has a unique role in the region's transit fare collection system. It is responsible for implementing and maintaining shared central systems and processes to support the single regional fare structure. These central systems and processes include:

- Contactless smart card computer systems and devices for processing, administering and reporting transactions
- Farebox computer systems, data collection and reporting (as requested/required)
- Farebox and cash collection device and software repair consulting and support
- Farebox/contactless smart card systems operation training
- Fare media acquisition and distribution coordination – Contactless smart card, coupons, tokens, magnetic stripe cards, special events media
- Electronic and manual remote sales and transaction reporting (contactless smart card balance and activity) – website, phone /voice response system

- Customer programs (Metro Pass, UPass, College Pass, Student Pass, jobseekers, homeless, etc) development, implementation and administration.
- Retail sales outlets including transit stores, independent (contract) retail outlets, and mail order
- Compact point of sale device implementation, administration, and maintenance at select retail outlets
- State Fair and other event (Vikings, Twins) special fare/ticket sales and administration
- Provider operations group coordination and development of best practices.

Transit fares are presently validated and collected in a variety of ways in the Twin Cities metro area. Table 7-3 identifies the validation and collection location, media, and mechanism for LRT, Commuter Rail, and Highway BRT express. Table 7-3 also presents the information for limited-stop local bus as a comparable baseline mode for planned Arterial BRT and Highway BRT station-to-station service.

Table 7-3 – Existing Transitway Fare Collection Characteristics in the Twin Cities

	Limited-Stop Local Bus[1]	**LRT (Hiawatha)**	**Express Bus with Transit Advantages and Highway BRT Express**	**Commuter Rail (Northstar)**
Fare Collection Location	On-Board	Off-Board	On-Board	Off-Board
Fare Media	Go-To SuperSaver Cash Token Coupon	Go-To TVM Ticket Cash Token Coupon	Go-To SuperSaver Cash Token Coupon	Go-To TVM Ticket Cash Token
Fare Payment and Validation Mechanism	Fare Box Go-To Validator (on-board)	Ticket Vending Machine Go-To Validator (off-board) Passenger Fare Inspection by Police Officers	Fare Box Go-To Validator (on-board)	Ticket Vending Machine Go-To Validator (off-board) Passenger Fare Inspection by Police Officers

Notes:
(1) For comparison to planned Arterial BRT and Highway Station-to-Station BRT services.

Ridership demand, especially during peak travel times, is an important consideration in the selection of fare collection systems. Table 7-4 summarizes daily ridership existing or forecast for transitways in the region. It also illustrates the range of peak demand observed or forecast at stations along the line.

Table 7-4 – Ridership Demand by Mode

	Arterial BRT	Highway BRT Station-to-Station	LRT	Highway BRT Express	Commuter Rail
Existing or Planned Mode	Planned	Planned, scheduled to open in 2012	Existing with Central Corridor LRT scheduled to open in 2014	Existing	Existing
Ridership (per weekday)	TBD – Estimating 5,000 to 15,000(1)	2,000 to 8,000	20,000 to 40,000(2)	3,000 to 5,400(3)	2,000
Estimated Peak Demand at Peak Station (per weekday trip)	15-35	15-25	75-150 today 300+ future	25-70	250-300

Notes
(1) Existing local bus routes in these corridors carry 3,000 to 10,000 rides per weekday.
(2) Hiawatha presently carries more than 30,000 rides per weekday.
(3) Forecasting work for Cedar Avenue has estimated weekday ridership at 5,400 in 2030.

The characteristics of the various fare collection location and media translate into a measurable performance attribute for transitways – speed of boarding – which significantly affects route travel time (speed) and travel-time reliability. Table 7-5 summarizes the speed of boarding for each scenario. It should be noted that data in Table 7-5 was based on observations within the region and should be used for planning purposes only.

Table 7-5 – Speed of Boarding by Fare Collection Scenario

Fare Collection Location	On-Vehicle					Off-Vehicle
Fare Media	Cash	SuperSaver	Coupon	Tokens	Go-To	ALL
Boarding Speed per Customer (seconds)	5+				1.5-2	1.5 to 2 (faster times for vehicles with two or more doors)
Boarding Speed	Slow →					Fast

In addition to affecting speed of boarding, the four fare collection mechanisms in use in the region – on-vehicle fare box, on-vehicle Go-To validator, off-vehicle Go-To validator, and off-vehicle ticket vending machine – each have different enforcement and processing requirements, data collection capabilities, and cost considerations. These attributes are summarized in Table 7-6 and Table 7-7. It is important to note that validated fares are presently used as the primary source for transit ridership data that is used for service analysis and development. In addition, significant federal funding is dependent on annual ridership reporting.

Table 7-6 – Fare Collection Mechanism Attributes

	On-Vehicle		Off-Vehicle	
	Fare Box	**Go To Validator**	**Go To Validator**	**Ticket Vending Machine**
Fare Collection Enforcement	Driver presence Metro Transit Police support if requested	Driver presence Metro Transit Police support if requested	Proof of payment Metro Transit Police fare inspectors	Proof of payment Metro Transit Police fare inspectors
Fare Processing	Daily – requires physical collection; physical counting, deposit, and reconciliation	Daily – automated collection; electronic download; systematic reconciliation	Multiple times daily (batch)– automated collection via deduct at rail station contactless smart card validator; electronic download; systematic reconciliation	Multiple times daily (batch) – largely automated collection via credit/debit card; as needed physical collection, counting, deposit, and reconciliation of cash
Ridership Characteristics Data Collection	Daily – requires physical collection via electronic interface Vehicle boarding information	Daily – automated collection Vehicle boarding information (pay leave only)	Daily - automated collection Station boarding information	Daily - automated collection Station boarding information
Ridership Data Processing	Daily – some details	Daily - detailed	Multiple times daily – detailed, but limited to station	Multiple times daily – detailed, but limited to station

Table 7-7 – Fare Collection System Cost Attributes

	On-Vehicle		Off-Vehicle	
	Fare Box	**Go-To Validator**	**Go-To Validator**	**Ticket Vending Machine**
Fare Collection and Validation Mechanism	$15,000 per unit	$4,000 per unit	$6,000 per unit, which includes police card reader	$70,000 per unit
Fare Collection Enforcement	Driver presence	Driver presence	Police presence & inspection	Police presence & inspection
Fare Processing	Manual probe of farebox with manual count of cash	Automated processing and reporting	Automated processing and reporting	▪ Manual collection & counting of cash Credit card fees when utilized Automated processing and reporting
Ridership Data Collection and Processing	Manual daily farebox probe to retrieve data	▪ Automated processing and reporting of details ▪ Detail service level ridership available by vehicle	▪ Automated processing and reporting of details	▪ Automated processing and reporting of details

7.3.2. Existing Conditions in Other Regions

Table 7-8 summarizes fare collection system for bus-rapid transitways in other regions. The effort did not explore fare collection systems for LRT or Commuter Rail lines in other regions as fare collection systems for these modes will continue to be off-vehicle in the region and enforced through proof–of-payment passenger fare inspections by Metro Transit Police. Reported ridership for the BRT systems surveyed ranges from 4,100 rides per day on the Salt Lake City MAX to over 40,000 riders per day on one of the Los Angeles Metro Rapid lines.

All transitway systems explored in other regions collect fares. The fare collection methods used include ticket vending machines, contactless smart card validators, and fare boxes that accept a variety of fare media – contactless smart cards, magnetic stripe cards, and cash/coin.

Off-board fare collection systems, largely enforced using proof-of-payment and fare inspections, have been implemented on several transitways surveyed in other regions. These include Cleveland, Eugene, Los Angeles Orange Line, New York Select Bus, Everett Swift, Salt Lake City, and York (Ontario, Canada). However, Kansas City MAX, the Los Angeles Silver Line and Metro Rapid lines, and the Pittsburgh Busways have implemented on-board fare collection. The Boston Silver Line uses a combination off-board/on-board collection system. As of summer 2010, these regions identified the following key reasons for selecting on-board fare collection systems:

- Boston – consistency in fare collection technology across the entire system.
- Kansas City – on-board fare sales is an interim approach. Kansas City staff indicated they intend to implement off-board ticket purchasing in the future.
- Los Angeles Silver Line – the unique zoned fare structure is not compatible with off-board fare collection.
- Los Angeles Metro Rapid lines – the station designs did not leave space for ticket vending machines.
- Pittsburgh – the cost of staffing and labor agreements along with the inability to secure station areas in a way that make riders pass fare vending equipment to board or alight from a bus.

Of the regions who responded regarding ridership measurement, most used fare collection to measure ridership data, with the exception of Eugene EmX and the Pittsburgh Busways. Both Eugene and Pittsburgh use automated passenger counters (APCs) to measure ridership data. Eugene cited complications between multi-door boarding and ridership measurement through fare collection as the primary reason for their use of APCs. In the case of Pittsburgh, staff cited dated fare collection technology used on the Busways as the reason they use APCs to collect reliable ridership data. However, Pittsburgh is in the process of implementing more sophisticated fare collection technology (smart cards) and they have noted that they may use fare collection to measure ridership once the implementation is complete.

In terms of service operations, reasons given for implementing off-board fare collection included anticipated faster boarding speeds which support decreased dwell and thus faster route travel/running times. In regions with on-board fare collection, Pittsburgh noted it is transitioning to smart cards to speed boarding and running times, lower fare evasion rates, provide accurate ridership data to assist in route planning, create seamless transfers to other regional buses, and to replace an outdated fare collection mechanism as it is becoming difficult to find replacement parts for the fare boxes.

While each fare collection system includes costs as well as benefits, staff from the Everett Swift line noted the costs associated with off-board fare collection have been off-set because the improved system performance has allowed the line to purchase and operate two fewer vehicles. The Everett Swift staff has observed comparable fare collection system costs that result in improved customer experience as demonstrated through faster travel times and improved travel-time reliability. The Everett Swift daily ridership is given as approximately 3,500 boardings per weekday as reported in October of 2010 by Community Transit.

The National BRT Institute (NBRTI) published a document in February 2009 called, *Characteristics of Bus Rapid Transit for Decision-Making*. In it, the authors state that expediting efficient boarding is one of the most important technical objectives of fare collection on BRT systems. The document goes on to identify three means through which expediting efficient boarding can be accomplished: the fare structure, the type of fare collection (on-board/off-board), and the fare media used. Table 7-9 summarizes the fare collection location and fare media information presented in the report. Fare structure was not summarized since the topic is outside the Fare Collection Systems Technical Committee scope.

Table 7-8 – Fare Collection System Characteristics from Transitways in Other Regions

	Boston	Cleveland	Eugene	Kansas City	Los Angeles	Los Angeles	New York City	Everett	Pittsburgh	Salt Lake City	York Region, Ontario
	Silver Line	Healthline	EmX	MAX	Orange & Silver Lines ("Heavy" BRT)	Metro Rapid ("Light" BRT)	Select Bus	Swift	East, South & West Busways	MAX	Viva Lines
Ridership (per weekday)	15,000	20,000	7,000	5,300	20,000 (Orange Line)	9,000 to over 40,000	31,000	3,500		4,100	
Fare Collection System	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fare collection system type?	Automated Fare Collection (AFC) fare boxes - fare boxes accepting all fare media (electronic cards, magnetic strip cards, cash/coin) and that validate every transaction automatically.	Ticket vending machine w/validators	Parkeon machines which accept cash or credit/debit and issue a time-stamped ticket	GFI fare boxes	Automated ticket machines (Orange Line)		Two types of machines in use: Re-purposed MetroCard “express” machine for customers with MetroCards; Re-purposed Parkeon multi-space parking meter for customers with coins	Automated ticket vending machines for cash and credit card-paying customers and tap card readers for ORCA users. NOTE: transfers are only given to those who pay with ORCA cards, not cash	Cash and non-electronic passes are currently being used; electronic fare cards system in development		
Fare collection on-board or off-board?	On-board (except airport station has off-board)	Off-board (have to show ticket when getting on-board). On-board fare boxes as well (optional).	Off-board on the boarding platforms	On-board	Off-board on Orange Line, on-board on others	On-board (plans for off-board have been shelved due to insufficient room at stops for ticket vending machines)	Off-board (operator issues transfers on-board for riders who pay with coins)	Off-board	On-board	Off-board	Off-board
Fare collection enforcement?	AFC fareboxes have built in validators	Proof of payment; police doing random fare checking	Random fare checkers	Operator observation	Proof of payment; fare inspectors	Operator observation	Proof of payment receipt; Fare inspectors on vehicles and at stations (not police/peace officers)	Proof of payment; fare inspectors	No special enforcement techniques used; random fare inspectors will be used after electronic passes are implemented		Proof of payment
Fare collection the same on BRT and regular bus fleet?	Yes	Healthline and rail	No, rest of system uses traditional on-board fare collection	Yes		Yes	No	No	Yes, system wide	Same as rail	
Fare collection used to meausre ridership?		Yes, one way	No	Yes			Yes	Partially; The fare collection technologies are used as an input into the ridership model, which is calibrated against real-world observations.	No, but may be used once electronic cards are fully implemented		

Fare collection system service effects?	Faster boarding times	Faster boarding	Faster boarding; multi-door boarding		Speeds passenger loading		Lower fare evasion rates; significantly improved travel time	Faster boarding; overall reduction in running time	Electronic fare cards are being implemented to speed boarding and service, lower fare evasion rates, provide accurate ridership data to assist in route planning, create seamless transfers to other regional buses and to replace an outdated system (hard to find replacement parts for the fare boxes)	Faster boarding	Faster boarding
Fare collection system cost and/or benefits?	Initially, the AFC fare system caused time delays because of issues with the new technology. Additionally, because the number of electronic passes were limited to 300, the AFC fare box didn't differ much from traditional fareboxes. In order to achieve the desired effects of the technology, AFC farebox was redesigned and other efforts were made to streamline the fare collection process.	Euclid Avenue Fare Collection Project costs: $10 million (Included 18 TVM's along Red Line, 75 TVMS along Healthline, and 14 validators along Healthline)	Cost: Fare collection cost (capital cost) was about $15,000 per station. The Parkeon machine itself cost between $10,000 and $12,000 each.		$6 million		$27,000 per machine + engineering and installation costs = approx. $50,000 each; occasional power issues at stations, but much faster boarding	Allows 12 buses to run during peak rather than 14. The cost of the fare collection equipment was offset against having to buy 2 additional vehicles. Parallel to that, the cost of ongoing fare collection and fare inspectors was offset against the cost of operations for 2 additional vehicles. Surprisingly, the costs were almost identical for both scenarios - but off-board fare collection gives customers a faster, more reliable trip.	Total project cost if $32 million for whole system		

Table 7-9 – NBRTI Summary of BRT Fare Collection Characteristics in Other Regions

Source: *Characteristics of Bus Rapid Transit for Decision Making, NBRTI, Feb 2009*

POB - *Pay On Board,* ***POP -*** *Proof-of-Payment (POP)*

			Fare Collection Process			Fare Media Used			
Service	**Location**	**Mode**	**POB**	**POP**	**Barrier**	**Cash**	**Paper**	**Mag Stripe**	**CSC**
Rapid Ride	Albuquerque	BRT	x			x	x		
Silver Line	Boston	BRT	x		x	x	x		x
Neighborhood Express	Chicago	BRT	x		x	x	x		
Healthline	Cleveland	BRT		x					
EmX	Eugene	BRT		x					
City and County	Honolulu	BRT	x			x	x	x	
MainStreet Max	Kansas City	BRT	x						
North Las Vegas MAX	Las Vegas	BRT		x				x	
Metro Rapid	Los Angeles	BRT	x			x	x		
Orange Line	Los Angeles	BRT		x			x		
South Dade Busway	Miami	BRT	x			x	x	x	
Rapid San Pablo Corr.	Oakland	BRT	x			x	x		x
LYMMO	Orlando	BRT							
RAPID	Phoenix	BRT	x			x	x		
All Busways	Pittsburgh	BRT	x			x	x		
EBus	Sacramento	BRT	x			x	x		
Rapid 522	San Jose	BRT	x			x	x		
MetroLink	Halifax	BRT	x			x	x		
Transitway	Ottawa	BRT		x		x	x		
VIVA	York, ON	BRT		x			x		
Transmilenio	Bogota	BRT			x	x			x
Metrovia	Guayaquil (Ecuador)	BRT			x	x			x
Megabus	Pereira (Columbia)	BRT			x				x
Zuidtangent	Amsterdam	BRT	x	x			x		
Tram on Wheels	Caen (France)	BRT	x	x				x	x
Fastlink	Edinburgh	BRT	x	x		x			x
Phileas - Western Corr.	Eindhoven	BRT	x	x			x		
Superbus	Leeds	BRT	x			x	x		
Crawley	London	BRT	x			x			
TEOR	Rouen (France)	BRT		x					x
Busway	Utrecht	BRT	x	x			x		
North East Busway	Adelaide	BRT	x			x	x	x	
SE and IN Busways	Brisbane	BRT	x			x	x	x	
T-Ways	Sydney	BRT	x			x	x	x	
Line I	Beijing	BRT			x	x			x
Line BI	Hangzhou	BRT			x	x			x
Busway Network	Kunming	BRT	x			x			x

7.4. FARE-COLLECTION SYSTEMS GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff, the following Fare Collection Systems Guidelines are recommended for adoption. These guidelines should be considered collectively when making fare collection system decisions for transitways. The guidelines are summarized and discussed below.

7.4.1. Proven and Reliable Fare-collection System Methods and Technologies

Transitway fare-collection systems should be modern, be consistent with best practices from comparable transitways in the region, and use proven technologies.

Fare-collection systems are continuously evolving to incorporate new technologies and methods to improve efficiency, reliability, and convenience for the customer while ensuring fares are collected and appropriate information is available for transit provider decision-making. To support these performance characteristics, transitway fare-collection systems should clearly convey efficiency through innovation and incorporation of appropriate best practices from comparable transitways. To ensure expected benefits are achieved from fare-collection investments, fare-collection system components should be proven reliable with long-term viability.

7.4.2. Fare-collection System Supports Customer Convenience

Transitway fare-collection systems should support equal accessibility for customers of all ages and abilities, whether frequent or occasional riders, by providing fare products at a variety of prices that are easy to use. Methods for payment should be well communicated, consistent, and predictable and provide a seamless experience for customers using multiple transit modes in the region. While meeting the other fare-collection system guidelines, transitway fare-collection system should do the following:

- *Provide options to customers at the level of their preferred investment in fare payment products (i.e., single ride, multiple ride, or period pass).*
- *Provide consistent and predictable systems that enable customers of all ages and abilities pay their fare and do not require that customers know how to pay their fare before entering a transitway station.*
- *Use images as well as words to convey key fare-collection information such as cost to ride, fare media accepted, fare-collection location and mechanism, and the fare-validation or enforcement process.*

Transitways are intended to provide service that emphasizes customer accessibility and convenience. To achieve these performance objectives, the transitway fare-collection systems should meet the needs of both frequent and occasional customers. The primary customer needs in terms of fare payment vary according to customer levels of available financial resources, transit riding experience, and language, physical, and cognitive abilities.

- According to Project Development, Leadership, and Oversight Guideline 10.6.3. Lead Agency Candidates and Responsibilities, a communications and marketing committee should be established for each transitway corridor to deliver an effective and comprehensive rider communication/education effort during and following start-up of any transitway service. The committee's efforts should include providing information on fare payment.

7.4.3. Fare-collection System Supports Service Requirements

Transitway fare-collection systems should support service requirements by integrating with the region's existing fare-collection system, supporting changes in fare policy, and supporting efficient boarding time, fare validation, and reliable travel times that are competitive with comparable travel modes.

The operation of fare-collection systems is a key consideration. Along with reliability and convenience, transitways are intended to provide service that is fully integrated with the rest of the regional transit system. In addition, regional transit fare policy will be periodically updated by the Metropolitan Council to incorporate and address changes in the regional operating environment, transit service levels, or new services. Recent changes included a fare increase, introduction of new fare media, and the creation of fares for new services such as Hiawatha light-rail transit (LRT) in 2005 and Northstar Commuter Rail in 2009. The fare-collection system should offer flexibility to respond to these types of changes.

7.4.4. Fare-collection System Supports Accurate and Complete Data Recording and Processing

Transitway fare-collection systems should provide accurate, detailed revenue and ridership data commensurate with data provided by other comparable services and existing transit provider expectations. Ridership data collected using fare-collection systems is used along with other ridership data for the analysis of service efficiency and effectiveness, and for federal reporting.

Passenger fares comprise a significant portion of transit funding within the region so it is critical fare-collection systems are accurate, complete and secure in accepting and processing revenue. The fare-collection and validation systems are also presently the primary ridership data source for transit service development and analysis, as well as annual reporting required by federal funding regulations. While emerging technologies may allow the primary source of the ridership data to change in the future, transitway fare-collection systems should continue to be a rich data source used to measure, improve, and enhance transitway service and corroborate other ridership data collection techniques into the future. Revenue data will be provided at an expected level of detail comparable to others agency components and existing standards.

7.4.5. Fare-collection System Fits Well in the Region

Transitway fare-collection systems should be a good fit for the region. In evaluating fit and making fare-collection system decisions, the Metropolitan Council will work with project partners to identify and evaluate factors including, but not limited to, a system's ability to meet the guidelines listed above, as well as its relationship to existing fare-collection methods in the region, in the corridor, capital and operating costs (including enforcement costs, if any), passenger characteristics, customer convenience, transitway operations performance, system flexibility/adaptability, vehicle and/or station's ability to accommodate fare-collection equipment, estimated travel-time impacts, customer perception, and driver interaction requirements.

Transitway fare-collection systems should build on the strengths of the region's existing transit fare-collection system and it should be acknowledged when selecting any new fare-collection system that the decision sets direction in the region for a considerable timeframe. For these reasons, the region should perform a detailed analysis when preparing to select a fare-collection system for a transitway. The analysis should carefully evaluate a system's ability to meet the guidelines provided above, as well as the following factors:

- Relationship to existing fare-collection methods in the region – a number of fare-collection methods are in use in the region today. The region should identify and evaluate functional similarities and differences between any proposal and existing fare-collection methods.
- Existing fare-collection methods in the corridor – customers will benefit and find transitway service easier to use if fare-collection methods within a transitway corridor are reasonably consistent and well communicated. For example, if all but one station within a corridor warrants installation of ticket vending machines, consider installing ticket vending machines at all stations in the corridor.
- Capital and operating costs – operating costs should include enforcement costs for any scenarios where a vehicle's driver is unable to effectively monitor fare collection for all riders.
- Passenger characteristics – including share of frequent and occasional/special event riders, express and station-to-station riders, Go-To card and cash users, etc. of total riders and new riders.
- Customer convenience – including forms of payment accepted by the proposed fare-collection system (e.g., cash, inexact change, credit card) and availability of nearby transit fare retail outlets (e.g., Cub Foods, CVS, etc).
- Transitway operations performance – the fare-collection method should be considered as one of the factors with potential to enhance operational efficiencies and passenger conveniences on transitways (e.g., boarding and overall transit travel times can be reduced when fare-collection changes are implemented on routes with regularly high volumes of cash paying customers).
- System flexibility/adaptability – transitway ridership demands vary throughout the day and year. System flexibility is an important consideration in managing costs and meeting customer expectations. The region should identify and evaluate opportunities for flexible use of potential fare-collection methods.
- Vehicle and/or station's ability to accommodate fare-collection equipment – fare-collection equipment requires space, power, and security monitoring on vehicles and/or at transitway stations. The region should identify and evaluate transitway vehicle and/or stations' ability to meet these requirements for potential fare-collection systems.
- Estimated travel-time impacts – the transitway travel-time impacts of different fare-collection methods vary. Boarding volumes per station per trip are also a travel time factor that may influence fare collection decisions. The region should identify and evaluate estimated travel-time impacts for potential fare-collection methods.
- Customer perception – the region is working to develop broad understanding of the transit system among the general public. The region should identify and evaluate how transit patrons will perceive potential fare-collection methods as compared to other fare-collection methods existing in the region.

- Driver interaction requirements – customer-driver interactions regarding fare collection often increases transit station dwell times and place substantial knowledge demands on the driver. The region should identify and evaluate anticipated driver interaction requirements for potential fare-collection methods. Based on this guidance, the region analyzed potential fare-collection system scenarios for Highway BRT station-to-station service.

An example of this analysis is included as Appendix D of this report.

8. TECHNOLOGY AND CUSTOMER INFORMATION

8.1. INTRODUCTION

8.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway technology and customer information through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the document is organized into the following sections:

- Relevant background information including applicable laws and regional policies
- Existing conditions in the region and in other regions
- Guidelines recommended through the technical development process

8.1.2. Committee Purpose

The Technology and Customer Information Technical Committee encompasses a wide array or range of potential topics, especially since transit technology and customer information are evolving rapidly along with the rest of technology in society. It would be impossible for this committee to directly address the future technologies are not available yet. Instead, the committee focused on providing direct guidance for existing and emerging technologies in the region. Additional guidance was discussed and developed for how to analyze and assess new technologies and their relevance to transitways. The committee acknowledged that technology guidelines need to be adaptable to the future and the most useful tool is to layout the considerations and process for analyzing technologies.

8.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the Technology and Customer Information Technical Committee discussion include Arterial Bus-Rapid Transit (BRT), Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

8.2. BACKGROUND INFORMATION

8.2.1. Definitions

The following section defines terms applicable to the Technology and Customer Information Guidelines.

Automated passenger counters (APCs) – Automatic passenger counters are devices onboard transit vehicles to record boardings and alightings at each stop and a running total of passengers onboard the vehicle. The APC units include emitting/ receiving sensors at doorways to monitor passenger movements on and off a vehicle. An APC system creates an electronic record at each bus stop, typically including stop location, stop date and time, time of door opening and closing, and number of passengers boarding and alighting. APC data downloading options include manual downloading via a laptop computer, wireless data via a local area network, and real time reporting. The technology is primarily used to collect ridership data and improve service development. APC data is often integrated with automatic vehicle location systems to perform more detailed data analysis.

Automatic vehicle location (AVL) – Automatic vehicle location systems determine the location of each vehicle in an equipped fleet. Global positioning system (GPS) technology is the most common type of AVL system. AVL systems are utilized throughout the transit field for safety, security, operations, customer information, and planning.

Automated annunciation system - Automatic annunciators provide an audible representation of the real-time bus departure information at the bus stop. The annunciators are primarily provided for vision-impaired transit customers. The system is operated through a push button actuation initiated by the transit customer.

Dynamic message signs – Dynamic message signs are located along major freeways and arterials and at select park-and-ride locations. The purpose of these signs is to communicate the following information to commuters: 1) the availability of parking spaces at park-and-ride facilities, 2) estimated travel times in minutes, comparing general traffic to buses from the park-and-ride facilities, and 3) the number of minutes remaining until the next bus departs from select park-and-rides. This information is also made available via websites and automated phone services.

En-route customer information – En-route customer information is provided to customers on their way to a transit station. Real-time customer information requires an AVL system to be in place and some form of end-user technology such as wayside message signs, mobile phones, and other web-enabled handheld devices.

In-vehicle passenger information – In-vehicle passenger information typically includes real-time information on the next stop, vehicle schedule, transfers, and delays. In-vehicle passenger information requires an AVL system to be in place and is usually provided through automated annunciation systems, dynamic message signs, and computer/monitor display systems.

Lane-keeping assistance systems – Lane-keeping assistance systems (also known as vehicle guidance systems) guide non-rail transit vehicles on runningways allowing them to reach higher speeds. This can be achieved in two ways, by providing feedback to the driver or by controlling the vehicle automatically.

Pre-trip customer information – Pre-trip customer information provides transit users with information to assist them in their travel decisions. The four primary types of pre-trip information include general service information, itinerary planning, real-time information, and multimodal travel information.

Precision docking – Precision docking assists non-rail vehicle drivers in accurately placing the vehicle at a stop or station, both in terms of longitude and latitude. Different system types include optical, magnetic, machine vision, and microwave radar.

Signal timing/phasing optimization – Signal timing/phasing optimization is a rearranging of traffic signal sequences at selected intersections to reduce delay for transit vehicles. This can be achieved through reduced cycle length, phasing changes, and offset turning for bus speeds.

Station and lane access control – Station and lane access control systems restrict access to dedicated transit runningways to non-transit vehicles through the use of dynamic message signs and gate controls systems.

Station passenger information – Station passenger information plays a significant role in keeping users informed about the status of their vehicle and directing them to the correct stops/stations. Typical station/terminal information includes real-time information describing current transit operations such as delays, incidents, service diversions, as well as, estimated vehicle arrival/departure times. Station/terminal information is usually displayed through dynamic message signs or computer/ monitor display systems.

Transit signal priority (TSP) – Transit signal priority is an altering of signal timing to give priority to transit vehicles as they approach equipped intersections with green light extension and red light truncation being the most common forms. There are several different types of signal priority that can be given, primarily based on meeting certain pre-established conditions (known as conditional-based TSP).

Traffic signal preemption – Traffic signal preemption is an altering of signal timing that automatically triggers a signal change at upcoming stations for the transit vehicles entering a controlled intersection.

8.2.2. Existing Laws and Regulations

The following section summarizes the existing laws and requirements relevant to the Technology and Customer Information Guidelines.

8.2.2.1. Minnesota Manual on Uniform Traffic Control Devices

Any sign or device installed on a public roadway, including transit signal priority and dynamic message signs, must abide by the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) regulations. Document can be viewed and downloaded from the Minnesota Department of Transportation (Mn/DOT) website: http://www.dot.state.mn.us/trafficeng/publ/mutcd/index.html

8.2.3. Existing Regional Policy

The following section summarizes the existing regional policy relevant to the Technology and Customer Information Guidelines.

8.2.3.1. Vehicle Fleet Policy

The Metropolitan Council, in cooperation with regional transit providers, has developed a Vehicle Fleet Policy for providers of public transit in the region. The policy addresses vehicle equipment and ancillary items including aspects of technology that are discussed in these guidelines. These policies apply to all buses in the regional fleet, including transitway buses, and the Guidelines will not address issues that are already addressed in the Vehicle Fleet Policy unless specified and justified.

For eligible transitway buses, technology elements that are eligible for regional funding include security systems (cameras), radio systems, fare systems, and regional AVL equipment. Optional items include APCs.

8.2.3.2. Minnesota Statewide Intelligent Transportation System (ITS) Architecture

Systems/devices must abide by the Minnesota Statewide Intelligent Transportation System (ITS) Architecture available on the Mn/DOT website:
http://www.dot.state.mn.us/guidestar/architecture/mn_architecture.html.

The following is Mn/DOT's description of the Statewide ITS Architecture project and the history behind its implementation:

> *"The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, initiated Federal funding for Intelligent Transportation System (ITS) program. A key part of the program was the development of the 'National ITS Architecture.' The National ITS Architecture provides a common structure for the design of ITS infrastructures. The architecture defines the functions that could be performed to satisfy user requirements and how the various elements of the system might connect to share information. It also defines the framework around which multiple design approaches can be developed. Each approach tailored specifically to meet the user needs, while maintaining the benefits of a common approach.*

In 1995, as a result of ISTEA, the Minnesota Department of Transportation (Mn/DOT) developed a statewide ITS architecture known as Polaris. In a nutshell, Polaris combines applicable existing systems with developing technologies from both the public and private sectors statewide to create an interactive system with well-defined interfaces between services, functions, and components.

Subsequently, the Transportation Equity Act for the 21st Century (TEA-21), enacted in 1998, require Intelligent Transportation System (ITS) projects funded through the highway trust fund to conform to the National ITS Architecture and applicable standards. Though, Minnesota Guidestar Polaris, was thoroughly thought out, it pre-dated the National ITS Architecture and since the project was completed, various systems have been either developed or are in the process of being developed around Minnesota. The premise of this project was to update the current Polaris document to include the existing systems and planned systems utilizing procedures listed in the National ITS Architecture. In addition, this project addressed the interface issues not currently covered in the National ITS Architecture and established a mechanism to enable transportation practitioners in Minnesota, and implement ITS projects more effectively."[1]

The U.S. Department of Transportation (US DOT) has provided additional guidance on ITS Architecture based on the National ITS Architecture. The following further describes the goal of Regional ITS Architecture:

"State and local governments and transportation organizations apply transportation tools to address transportation issues on a regional basis. Each region has unique needs and is affected, in some manner, by neighboring regions. ITS is one of these transportation tools. It harnesses the valuable information generated by various subsystems within and around a region to better manage and operate the transportation system as a whole.

The purpose of developing a regional ITS architecture is to illustrate and document regional integration so that planning and deployment can take place in an organized and coordinated fashion. Typically, a region contains multiple transportation agencies and jurisdictions. These may have both adjoining and overlapping geographies, but the common thread for all of the agencies is the need to provide ITS solutions to transportation problems such as traffic congestion and safety hazards. It is important that these solutions be provided economically, utilizing public funds in a responsible manner.

Regional integration allows for the sharing of information and coordination of activities among regional transportation systems to efficiently and effectively operate. Regional integration may also have a synergistic effect on transportation systems (e.g. Information from one system may be used by another system for a different purpose. An example of this would be transit AVL data being used by a freeway management center as probe data to obtain speed information on freeway segments traveled by the transit vehicles.) A regional ITS architecture illustrates this integration and provides the basis for planning the evolution of existing systems and the definition of future systems that facilitate the integration over time.

For the private sector, opportunities exist to develop information systems providing value-added services to the traveling public. Participating in the development of a regional ITS architecture

1 http://www.dot.state.mn.us/guidestar/architecture/mn_architecture.html

can highlight needs for data integration between public and private partners. It can also identify ways in which public sector agencies can benefit from information that the private sector has.

This regional integration can only take place with the participation and cooperation of the organizations within a region. These stakeholders must work together to establish a regional ITS architecture that reflects a consensus view of the parties involved. A regional ITS architecture's most important goal is institutional integration; providing a framework within which regional stakeholders can address transportation issues together."[2]

Additional information on Statewide and Regional ITS Infrastructure is available through the US DOT and Mn/DOT starting with the guidance or reports referenced here.

8.2.3.3. Regional AVL and APC Standard Operating Agreement

The purpose of the Regional AVL and APC Operating Agreement is to define the rights and obligations to Metro Transit (Metropolitan Council) and all participating regional transit providers with respect to operations and maintenance of AVL and APC systems.

- The participating parties desire to respectively own and cooperatively operate and maintain AVL and APC equipment as part of a regional AVL/APC system to enhance their respective and coordinated operations.
- The AVL and APC equipment has or will be installed by a vendor enabling the effective management of respective parties' vehicle fleets.
- AVL and APC technology allows participating parties to enhance service and operations by facilitating fixed time connections, service quality monitoring, bus security, route scheduling, enhanced fare collection, and real-time customer information.
- Participating partners will use the same AVL and APC equipment, allowing seamless connectivity between providers at a reduced operating expense for the group than if providers used different equipment.
- The participating partners desire to enter into this agreement to set forth their respective rights, duties, and obligations with regard to the ownership, operation and maintenance of the AVL/APC system.

8.3. EXISTING CONDITIONS

This section provides information about the technologies currently being used in the region and the technologies used on BRT systems in other regions. The section concludes by summarizing general information from the National Bus Rapid Transit Institute (NBRTI) on ITS.

8.3.1. Existing Conditions in the Region

The Twin Cities region currently utilizes a number of technologies that relate to transitway implementation. These technologies can generally be categorized as established or emerging. The deployment of the different technologies varies from some region-wide systems to some provider-specific implementations to some select vehicle implementations. The following descriptions provide a

2 "Developing, Using, and Maintaining an ITS Architecture for Your Region" U.S. DOT. http://ntl.bts.gov/lib/jpodocs/repts_te/13598.pdf

summary of the implementation of each technology in this region. See also Table 8-1 for a complete summary of all relevant technologies.

8.3.1.1. Established Technologies

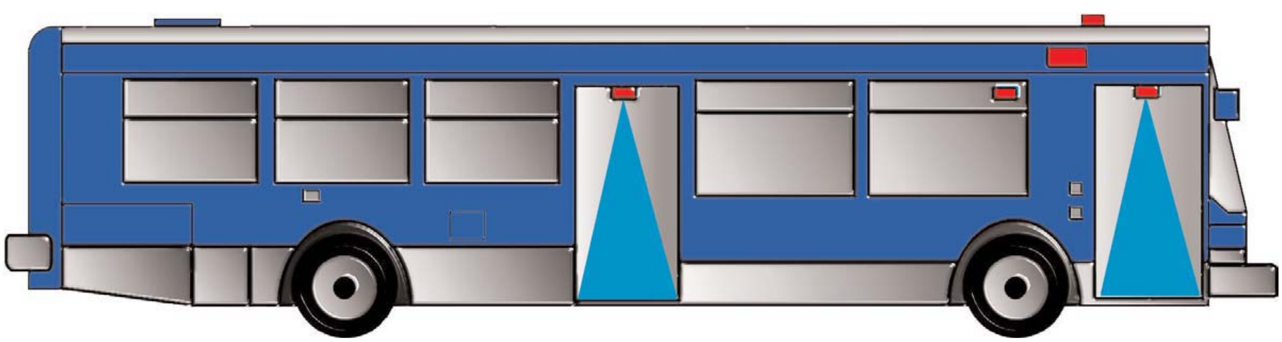
Established technologies are those prevalent throughout the majority of the transit system and are often the basis for other technological advancements. The use and effectiveness of these technologies are well known, although in many cases, still being expanded upon. Established technologies include AVL and APCs.

Automatic Vehicle Location (AVL)

Almost the entire regional regular route bus fleet is equipped with the same AVL system. The system is GPS-based and provides real-time vehicle location information, schedule adherence, passenger counts, and other fleet management messages transmitted to dispatch centers. The regional AVL system was deployed in two phases. The first phase equipped the entire Metro Transit bus fleet by 2002 and included the construction and outfitting of the transit control center (TCC). In 2008, the regional AVL system began to be equipped on all other regular route buses in the Metropolitan Council fleet. At the time of this memorandum's drafting, Minnesota Valley Transit Authority (MVTA) does not have an active AVL system on their fleet, but they are in the process of exploring a system.

Automated Passenger Counters (APCs)

APCs are used on a portion of Metro Transit's fleet and on a small portion of other regional vehicles. APC technology is deployed to collect random samples of passenger boarding information that is used in data collection and calculation. APC implementation began in 2002 with 100 buses and has grown as APCs are added to the fleet with each new bus purchase. APC technology is typically deployed at each door on a vehicle, as illustrated in Figure 8-1.Figure 8-1 – Illustrative Example of APC Technology Deployment



Communications Systems

Nearly all of the transit ITS technologies require some form of communications technology in order to function, provide data to other systems, and receive instructions. Most buses now have at least one method of communicating to the outside world, be it via radio, the driver's cell phone, or via a WLAN antenna. Communications technologies are evolving very rapidly and it would be futile to list the best communication method for each application. Communication can be broken down in two categories, live and differed. Recent advances in digital technology have transformed voice (analog) to another data transmission (digital).

Live data:

Live data is referred to data being sent during normal operations, when the bus is no longer in the confines of the garage. This data includes:

- Voice from and to the driver
- GPS coordinates (AVL)
- Text message from and to the driver
- Emergency button event transmitted to the control center
- Real-time bus arrival/departure information
- Passenger counts (can be live or deferred)

Live data is usually more expensive to transmit due to the required range. Data is therefore limited to light data transfers. Common methods of transmitting live data are:

- Cell phone (voice and data)
- Long range radio system

Deferred data:

Deferred data refers to data that is stored on the bus computer and downloaded once the bus is within the garage or at a scheduled time. Data may also originate from the garage to the bus. This data includes:

- Passenger counts (can be live or deferred)
- Update of route, announcements, and schedules
- Update of vehicle or remote device system software

Deferred data is usually reserved for heavy data transfers. Transmitting large files on a cellular network could be cost prohibitive. Therefore, these common methods of transmitting deferred data are:

- WLAN
- Short range radio system

Other Technologies

There are a number of other established technologies utilized by transit service providers in the region. However, they are not directly applicable to or within the scope of the Transitway Guidelines. Examples of these include police information management systems, internal garage bus locator systems, and VCR/DVR systems.

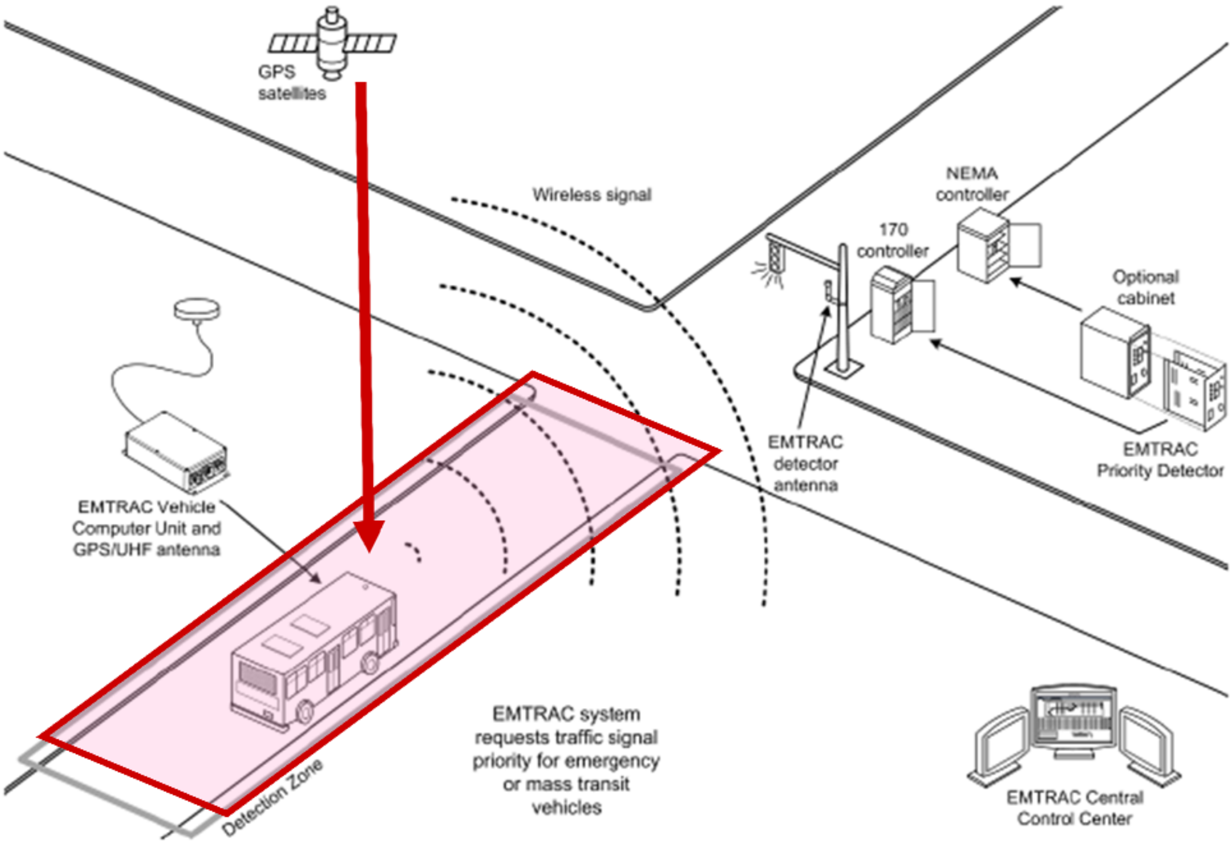
8.3.1.2. Emerging Technologies

Emerging technologies are newly implemented technologies that are only implemented in limited deployments or still in testing. The use and effectiveness of these technologies is still being explored for more widespread implementation. Emerging technologies include TSP, traffic signal preemption, automated annunciation systems, pre-trip customer information, dynamic message signs, en-route customer information systems, and lane-guidance assistance.

Transit Signal Priority (TSP)

Transit signal priority is currently utilized in a limited capacity in the region. TSP has been in operation since March 2010 on a portion of the Metro Transit bus fleet and at 29 intersections in the metro region. The TSP system currently being utilized is a conditional-based system that currently only initiates requests when the transit vehicle is (1) behind its scheduled time by three or more minutes and (2) limited to one TSP granted request at any individual intersection every eight minutes. Figure 8-2 includes an illustrative example of the components in a TSP system using Metro Transit's system as an example.

Figure 8-2 – Transit Signal Priority Components



Traffic Signal Preemption

Traffic signal preemption is currently only utilized on LRT at select intersections and has been in operation since the opening of the Hiawatha LRT line in 2004.

Automated Annunciation Systems

The Twin Cities region currently has a limited implementation of automated annunciation systems both on-board vehicles and off-board. On-board voice annunciation is currently implemented on a portion of the Metro Transit bus fleet and has been in effect on three Metro Transit routes – routes 10, 17, and 18 - since 2010. For on-board annunciation, the primary message conveyed is a next stop announcement. Off-board voice annunciation is currently implemented at 52 bus stop locations. The first implementation occurred in 2009, with additional stops being added in 2010. For annunciation at bus stops, the primary message conveyed is next bus departure information.

Pre-Trip Customer Information

Regional information on real-time bus departure times is available through telephone, via the Transit Information Center, and internet, via NexTrip. NexTrip (available at metrotransit.org) provides real-time bus departures for select stops, transit stations, and park-and-rides. When a route, direction, and stop are chosen, NexTrip will list up to the next 10 buses that will be departing from the chosen stop. Real-time location information is available for all Metro Transit buses and most regional transit buses. NexTrip will update automatically every few seconds. A text/mobile version of NexTrip is available for screen readers and mobile devices, as well as being available via Metro Transit's Transit Line customer service. NexTrip real-time displays are installed on Marquette and 2nd Avenues in downtown Minneapolis and at select transit centers, park-and-rides, and other locations.

Dynamic Message Signs

Dynamic message signs using LED displays are currently utilized in a limited capacity in the Twin Cities region. The LED displays are primarily located at transit stations. The largest deployment area is in downtown Minneapolis with over 40 signs deployed along Marquette and 2nd Avenues (see Figure 8-3). The second largest deployment area for the signs is at the Mall of America Transit Station. The Mall of America Transit Station serves as a key transit hub partly due to the interaction with the Hiawatha LRT line that serves the station. Additional dynamic message sign deployments include four park and ride facilities. In all, nearly 70 sign components have been procured as a result of the Urban Partnership Agreement (UPA) project. There are now over 81 NexTrip departure dynamic message signs currently in operation in the metro area. The real-time departure information is based off AVL data on the vehicle location and travel assumptions along the route.

Figure 8-3 – Illustrative Example of Dynamic Message Signs on Marquette & 2nd

En-Route Customer Information Systems (Transit Commuter Information System)

The en-route customer information system implemented in the Twin Cities region is a transit commuter information system. The roadside LED signs include information on bus and car travel time comparisons, park-and-ride space availability, and NexTrip departure information (see Figure 8-4). A parking space availability system using detection that "count" vehicles entering and exiting corridor park-and-ride lots along I-35W provides timely information to motorists via the use of roadside dynamic message signs that display whether or not the park-and-ride is at capacity. Other system information, including when the next transit bus will be departing the park-and-ride or the expected travel time for both cars and buses to downtown Minneapolis, is also displayed through the use of dynamic message signs in strategic locations along the I-35W corridor as well as through Metro Transit's web and phone information systems. There are currently 25 dynamic message sign locations which have been operational since 2009.

Figure 8-4 – Examples of Roadside LED Signs

Lane-Keeping (Lane-Guidance) Assistance

Lane-keeping assistance is currently only implemented on a small portion of MVTA's bus fleet. Implementation began in 2010 as a part of the Bus 2.0 project.

Table 8-1 – Current In-Region Technology Deployment Summary

Technology	Description	Vehicles Installed	Locations Installed	Status
Automatic Vehicle Location	Trapeze TransitMaster/ Fleet Management System – GPS-based	Metro Transit – 887 buses & 50 non-revenue vehicles Regional Transit – 195 buses	N/A	Operational since 2002; Regional buses added in 2009/10
Automatic Vehicle Location	Nextel System –	MVTA – 120 buses	N/A	Operational
Automated Passenger Counters	Red Pine / IRMA – TransitMaster subsystem	MT – 259 buses Regional – 99 buses	N/A	Operational since 2002 – APCs are added to fleet with each new bus purchase
Transit Signal Priority/ Wireless Gate Control	EMTRAC System – conditional TSP system that is a GPS-location/ virtual zone based system that uses wireless radio communication from bus to traffic signal system at intersections	MT – 887 buses Regional – 0 buses	18 - Central Ave. Intersections in MPLS and Columbia Heights 2 Cleveland/ I-35W – Roseville 2 Gates – 46th St./ I-35W BRT Station	Operational since March 2010
Automated Annunciation Systems	On-board voice annunciator Bus stop next bus annunciators	MT – 321 buses N/A	Routes 10, 17, & 18 currently installed 52 UPA bus stop annunciator locations Marq2, MOA, S. Bloom. TC, 46th St/ I-35W BRT Station	Operational since Feb. 2010; Operational since Dec. 2009
Traffic Signal Pre-emption	On Hiawatha LRT only	All LRT	16 intersections	Operational 2004
Dynamic Message Signs	Real-Time NexTrip departure signs/ displays	N/A	61 UPA sign locations Marq2, Mall of America,	Introduced to the region in 2008, Major expansion in

Technology	Description	Vehicles Installed	Locations Installed	Status
			Blaine P&R, Roseville P&R, Burnsville P&R, Lakeville P&R South Bloomington TC, 46th St/ I-35W BRT Station 4 TransitMaster locations Uptown TC, County Rd 73 P&R, Hwy 81/ 63rd P&R 15+ U. of M locations	2010
En-Route Customer Information: Transit Commuter Information System	Bus/ car travel time comparison Park & ride space availability bext bus departure information	N/A	25 sign locations In and near Blaine P&R, Roseville P&R, Burnsville P&R, Lakeville P&R	Operational since Dec. 2009
Lane-Keeping Assistance	GPS-enabled lane guidance technology developed in coordination with the University of Minnesota	10 MVTA Buses	Approximately I-35E & 77 to just east of 62 & Portland	Ongoing evaluation of emerging technology

8.3.2. Existing Conditions in Other Regions

There are a number of regions around the United States that have implemented BRT services that resemble the services proposed in the Twin Cities region. The ten peer region systems specifically reviewed in this document are:

- Boston Silver Line,
- Cleveland HealthLine,
- Eugene, Oregon EmX,
- Kansas City MAX,
- Los Angeles Silver and Orange Lines and Metro Rapid,
- New York City Select Bus,
- Everett, WA Swift,
- Pittsburgh Busways,
- Salt Lake City MAX

Each region was reviewed in terms of five different BRT technologies: TSP, AVL, APC, public address, and security cameras. The technology coordination requirements and practices in each region were also reviewed. The following sections summarize the results of the review of other regions. See also Table 8-2 for a brief overview.

Table 8-2 – Other Region Review Summary

Tech-nology	Boston *Silver Line*	Cleve. *Health*	Eugene *EmX*	Kansas City *MAX*	L.A. *Orange & Silver Line*	L.A. *Metro Rapid*	New York City *Select Bus*	Everett *Swift*	Pitts. *Bus ways*	Salt Lake City *MAX*
TSP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
AVL	Yes	Yes	Yes	Yes	Yes		No	No	No	Yes
APC	No	Yes	Yes	Yes	Yes		No	No	Yes	
Public Address	Yes	Yes	Yes	Yes			Yes	Yes	No	
Cameras	No	Yes	Yes	Yes	Yes		Yes	No	Yes	

8.3.2.1. Transit Signal Priority (TSP)

In the region reviewed, all but one of the BRT systems uses TSP for at least a portion of the runningway. The type of TSP service varies from a request-based system where priority is only given when the transit vehicle is running behind schedule to a true, primary signal priority system where top priority is given to the transit vehicles (emergency vehicles and pedestrians still retain priority over transit vehicles). The TSP implementations vary from small scale – only installed at the busiest intersections – to full regional implementation. The agency responsible for operating the TSP also varies across regions. In many cases, the responsibility falls to the area transportation authority. However, in some regions, the responsibility falls to the transit provider or to the local city. Coordination between these entities is required. A number of regions have hired outside consultants to set up the system and establish the cooperating procedures among the impacted agencies. The primary effects on service noted for TSP implementation are faster travel times, improved reliability/schedule adherence, and increased safety.

8.3.2.2. Automated Vehicle Location (AVL)

Nearly half of the regions reviewed identified AVL as a technology used on their BRT systems. All but one of the regions with AVL used a GPS-based AVL system, with the one exception using a transponder and antenna loop system. The primary reasons provided for implementing AVL systems were improved route planning/scheduling, more efficient service, increased schedule adherence, and improved customer information.

8.3.2.3. Automated Passenger Counters (APC)

The usage of APCs was mixed in other regions. Some regions use APCs on their entire transit fleet, while others only use them on certain lines/vehicles. Many of the regions do not use APCs at all. In the regions that have implemented APCs, the primary reasons were to facilitate off-board fare collection and multi-door boarding as a measure to speed the boarding process and overall service. APCs support this operational consideration by collecting required data on passengers that could otherwise be collected through on-board fare collection equipment.

8.3.2.4. Public Address)

Many of the regions use some kind of public address system on their BRT service. Most regions have their public address systems located on-vehicle, with one region also having some public address at their stations. The primary information provided through the on-board public address systems is automated stop announcements. The reasons cited for using a public address system on BRT service was to improve customer information and increase the ease of use for customers.

8.3.2.5. Cameras

Most of the regions reviewed utilize cameras on their entire transit fleet, in addition to the BRT routes. Cameras are almost always located on-board the vehicles with many regions also having cameras at major stations. The primary benefits noted for the utilization of cameras were increased passenger safety and security. Other uses of the cameras include incident investigation, litigation of claims, decrease liability, bus lane enforcement, and other criminal investigation and prosecution.

8.3.2.6. Technology Coordination

Almost all of the peer agencies cited the need to coordinate with other agencies in order to implement various technologies for BRT. They also cited that this coordination has the potential to create conflict. However, none of the peer agencies experienced significant problems with coordination. Some of the key efforts noted that made coordination efforts successful were high-level policy direction, early coordination efforts, and the creation of a BRT advisory group.

8.3.3. NBRTI Characteristics of Bus Rapid Transit for Decision-Making

The NBRTI published an updated version of the Characteristics of Bus Rapid Transit for Decision-Making[3] report in 2009. The purpose of the report is to provide planners and decision makers with basic information and data to aid in BRT decision making processes. In the ITS section of this report many

3 National BRT Institute. *Characteristics of Bus Rapid Transit for Decision-Making.* Washington DC: Federal Transit Administration, 2009.

potential BRT technologies are discussed. These technologies include AVL, APCs, TSP, and passenger information. For each technology, the NBRTI identifies the key reason for its implementation and associated considerations. In addition an overview of cost factors is included for each technology.

Automated Vehicle Location (AVL)

The NBRTI identifies many reasons for the implement of an AVL system. The most important reason is that AVL is the backbone to many other ITS applications. Additionally, AVL allows for easy monitoring of vehicles, reduces response time to incidents, improves on-time performance, and improves fleet utilization. The only consideration noted is the prerequisite of a data communication system for AVL implementation. It is also important to note the cost considerations of AVL implementation such as on-vehicle costs, as well as, general system costs.

Automated Passenger Counters (APCs)

There are a number of reasons noted for the implementation of APCs. The potential benefits of APC implementation include better and more timely data for planning purposes, improving revenue control, improving overall efficiency, and reducing the costs associated with ridership data collection. Two specific considerations were also identified. These considerations include required data maintenance and the potential for scheduling issues if the entire fleet is not equipped with APCs. The cost considerations associated with APC implementation are on-vehicle costs and general system costs.

Transit Signal Priority (TSP)

There are two key reasons for the implementation of TSP. The first is a reduction in traffic signal delay. This leads to the second, which is an improvement in on-time performance. Conversely, there are also a number of considerations associated with the implementation of TSP. The considerations include requiring technology upgrades, requiring field equipment installations, the need to be approved and coordinated with many agencies, and the potential for negative impacts on other road users. It is also important to consider the various costs associated with TSP implementation such as intersection costs, on-vehicle costs, as well as general system costs.

Passenger Information

In the NBRTI report, passenger information in divided into four principle categories – pre-trip, en-route, station/terminal, and in-vehicle. The reasons for implementing the technology are mostly the same across passenger information types. The common reason include a reduction in customer service call volume and the need for agents, an increase in customer information, an increase in customer satisfaction, an improvement in the quality of information, an increase in travel flexibility and choice for the customer, and an overall reduction in complaints. Additionally, there are a number of reasons for implementing unique to the in-vehicle passenger information technology. These include meeting Americans with Disabilities Act (ADA) requirements, increasing safety, reducing driver responsibilities, and improving navigation of the transit system.

Likewise, many of the considerations related to passenger information technology are common among the four types noted. These considerations include required information maintenance and dependence on the implementation of other technologies (AVL for example). Additionally, certain types of passenger information technology have additional considerations. Station/terminal passenger information may require power at stations and in-vehicle passenger information may require fleet replacement. Furthermore, there are different cost considerations associated with the different types of passenger information technology. All passenger information technologies require general system investments.

However, station/terminal and in-vehicle passenger information require additional cost considerations associated with station and vehicle level investments.

8.4. TECHNOLOGY AND CUSTOMER INFORMATION GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff, the following Technology and Customer Information Guidelines are recommended for adoption. It is important to note that these guidelines are not meant to be overly prescriptive, but rather provide a basis for understanding the elements important to decision making in a quickly evolving industry. The guidelines should be considered collectively when make technology and customer information decisions for transitways. The guidelines are summarized and discussed below.

8.4.1. Automatic Vehicle Location (AVL)

The regional AVL system, or a system that is compatible and can communicate with it, should be required on all transitway vehicles.

AVL is a critical system for many other technology systems in these guidelines. It is considered a base infrastructure upon which other features and applications can integrate with and build upon. AVL technology is applied to monitor the location of transit vehicles in real time through the use of global positioning system (GPS) devices or other location monitoring methods. Information about the vehicle location is transmitted to a centralized control center in either raw data format or as processed data. Transitway technology features and applications utilizing AVL technology include automatic passenger counters, transit signal priority (TSP), and real-time customer information systems.

8.4.2. Automatic Passenger Counters (APCs)

Automatic passenger counters should be required on all station-to-station transitway vehicles. APCs are recommended on a sample of other transitway vehicles.

APCs provide valuable information on ridership, station demand, and vehicle loads for service planning and data collection analysis. When coupled with AVL data, APC data assists service deployment decision making at specific stations and specific trips. APC data could also be used to determine real-time busloads for use in conditional-based TSP. In the absence of fare boxes on buses and trains, APCs also assist in ridership data collection and verification.

8.4.3. Communications Link

Proven communication systems should be required on all bus-rapid transit (BRT) service to link vehicles and stations that is compatible and coordinated with regional transit control center communication systems.

Communication between systems and personnel is critical to transit service operation and safety. Common or compatible systems are required for operations to insure proper service coordination and public safety. Communications technology implementation can be complex and often involves the coordination of different jurisdictions, agencies, and technologies. Collaboration between transit providers is essential to ensure that the communication systems implemented are viable and sustainable. An analysis of the corridor should look at all existing and potential communication systems and the effort and characteristics required for implementation.

8.4.4. Transit Signal Priority Coordination and Viability

TSP implementation needs to be a collaborative effort between transit providers who will utilize the technology on their vehicles and local road authorities who will utilize the technology at their signal controls. Before the implementation of TSP in a corridor:

- *An analysis should be done to determine the potential viability and coordination required for the use of TSP in that corridor.*
- *Approval should be sought by the implementing agency from coordinating parties such as cities, counties, state, and transit providers. Formal action may be necessary when appropriate.*
- *Ongoing operation and support roles and responsibilities should be identified and established.*

TSP implementation is complex and often involves the coordination of different jurisdictions, agencies, and technologies. Collaboration between transit providers and local road authorities is essential to ensure that the system implemented is viable and sustainable. Agency collaboration may include the development of an operational plan for TSP, such as a concept of operations, prior to deployment of any TSP system. Analysis of the corridor should look at all potential TSP intersections and the effort and characteristics required for implementation at those intersections. Formal approval (i.e. memorandum of understanding, etc.) from cooperating agencies may be necessary. Any operations and supports roles need to be identified early, in planning stages of TSP implementation, to allow for proper planning of staff and resources within agencies.

8.4.5. Transit Signal Priority Compatibility

The TSP technology used in a corridor should be compatible for use by transit service providers operating in that transitway. A regional TSP system or systems that can be compatible with limited additional resources are preferred and implementing agencies should explore maximum compatibility across the region, when feasible.

TSP technology will continue to evolve as it becomes more established around the nation and in the Twin Cities region. There are a variety of TSP systems available today and concurrently, there are a variety of traffic control systems implemented throughout the Twin Cities region. The relationship between TSP technology and traffic control technology is essential for proper operation of the system. Ideally, a regional TSP system will be developed that is consistent or compatible with all potential applications in the region. This would reduce overall TSP system costs and eliminate the need for coordinating multiple technologies among transit providers. However, there may be significant barriers to the implementation of a consistent or compatible system.

These barriers include the need for cooperation and coordination between multiple jurisdictions and agencies, sole sourcing to a particular vendor or common TSP approach, “hidden” costs associated to other traffic signal system upgrades, and signal retiming required to make TSP fully functional. Some barrier examples:

(1) Planned TSP corridor goes through two jurisdictions. One jurisdiction may have a traffic signal system and field hardware that is able to support the TSP system. The other may have an outdated system or require system or hardware upgrades. The result to TSP is that this may prohibit implementation or significantly reduce overall TSP system functionality.

(2) Traffic signals in the TSP corridor may not be currently timed to provide sufficient timing to provide enough advantage to transit vehicles for granted TSP requests without significant cost and time to complete the needed signal retiming.

(3) Intersections within the traffic system may be operating at capacity with limited options for providing priority to the transit vehicle in terms of extended green or early green.

8.4.6. Transit Signal Priority Characteristics

When implementing a TSP system on a transitway, the following should be standard characteristics:

- *Optimal signal timing and transit scheduling for person throughput*
- *Minimal cross traffic delays, unless otherwise agreed upon by cooperating traffic authority*
- *Conditions for TSP operation agreed upon by coordinating agencies*

Transit signal priority implementation can occur in a variety of forms ranging from full priority over signal controls to a conditional-based system where transit vehicles only request signal priority when certain conditions are met. It is important to optimize the standard timing of signals along a transitway and synchronize that timing with transit schedules to ensure the maximum number of roadway users (person throughput) are benefiting from the timing. This will help limit or provide agreed upon justification for any limited potential associated cross traffic delays that could result from TSP requests and will limit the number of requests being made by the TSP system. In some cases, optimized signal timing incorporating person throughput strategies may negate the need for TSP, or the number of intersections requiring TSP implementation. In addition, the priority for a TSP system should be conditional-based to limit the disruption (number of requests) of the signal timing system. Conditional based use may include when transit vehicles are running late, peak-hour only use, or only locations where allowing transit vehicles to proceed through would allow users to be picked up at a far side stop to reduce delay. Conditions for TSP operation should be developed as part of an operational plan, such as a concept of operations, for any TSP deployment.

8.4.7. Traffic Signal Pre-emption

Traffic signal pre-emption will only be used when specifically agreed to by project stakeholders and in compliance with state and federal laws, regulations, and guidance.

Rail systems may require the use of signal pre-emption because of the different physical characteristics of rail systems and rules or regulations governing their operation.

Pre-emption is defined as the transfer of the normal control (operation) of traffic signals to a special signal control mode for the purpose of servicing railroad crossings and emergency vehicle passage, such as, police, fire, and ambulance vehicles. It is also used in some transit applications as well, upon agreement with local jurisdictions and in compliance of the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD). This guideline recognizes the special cases upon which the technology recommendation for a specific project or transitway corridor to increase transit speed and reliability is via the use of traffic signal pre-emption. In addition, the use of signal pre-emption along rail systems may be required by rules or regulations. Rail vehicles operate in a significantly different manner than bus vehicles and require longer stopping distances and, often, increased safety precautions. In some cases, pre-emption may be the appropriate system for achieving required operating parameters. Impact of the transit vehicle pre-empting the signal when an opposing emergency vehicle requests service needs to be considered. This is a potential conflict and emergency vehicle delay that is not an issue when transit signal priority is employed.

8.4.8. Real-Time Customer Information System

Implementers of real-time customer information technology should deploy systems that supply/receive real-time data in a format compatible and able to be shared with all transit providers.

Real-time customer information can be disseminated to the public through a variety of means including, but not limited to, **pre-trip** (website), **en-route** (dynamic message signs or wireless web), **on the platform** (dynamic message signs), and **on-vehicle** (next stop information). The following are types of information provided: real-time bus/rail departure, park-and-ride space availability, and transit/car comparison travel times. Real-time customer information (the information used by transit users) should be accessible across all technology platforms, which requires real-time data (the information used by providers as the basis for real-time customer information) to be compatible and able to be shared across various technology platforms and providers.

8.4.9. Technology Needs or Benefits Assessment

The implementation of a technology requires a process for identifying the appropriate solution. At a minimum, there are key steps in the process that should be addressed during each assessment.

- *The first step is identifying the need for, or benefit of, a technology solution and establishing the outcome goals of implementation.*
- *The second step is exploring technology solutions that exist and are operational in the region today.*
- *If no existing solutions adequately address the need, the third step is exploring new technologies and determining their viability and sustainability in addressing the need or providing an added benefit to the transitway system.*

Technology needs assessments are primarily focused on emerging technologies or areas of need, but they should also be considered when implementing existing technologies, as well. The needs assessment should ensure that a technology solution can adequately address an area of need, that solutions that capitalize on existing infrastructure are considered to reduce costs and increase interconnectivity, and that any new technologies introduced to the region are a viable and worthwhile investment. Other technology assessments may not directly address an identified need within the system, but may provide worthwhile benefits that enhance or improve the system if implemented. An assessment similar to the needs assessment should address the potential benefits, existing technologies, and other factors.

8.4.10. Technology Implementation Viability Considerations

At a minimum, technology viability, as discussed in Guideline 8.4.9, should factor in the following considerations:

- *Relative costs of potential technology solutions including initial capital investment and ongoing operations, support, and maintenance, including staff time and staff training.*
- *Cost considerations should include all levels of the technology including vehicle costs, station costs, road infrastructure costs, technology system costs, agency resource costs, and other areas as identified in the needs assessment.*
- *Advantages of each technology solution in addressing the need or potential benefits of the technology.*
- *Potential barriers to implementation of a technology solution.*
- *Expected useful life of a technology solution.*
- *Relationships to other technologies, including other required technology systems or required changes to other technology systems.*

Technology viability is an essential analysis because technology is a dynamic field that is constantly changing and adapting to new needs and emerging technical innovations. As such, considerations like costs, at all levels, advantages, barriers, and useful life are also constantly changing and should be reviewed periodically for technology. To reduce risk and ensure ongoing system viability, technology to be assessed for large scale or fleet-wide deployment needs to be commercially available, sustainable, and maintainable. Planned implementations need to consider its relation to other corridors, similar existing implementations, and impacts to other systems and stakeholders. Barriers may include coordination with collaborating agencies or technologies and may significantly limit the viability of technology solutions.

8.4.11. Other Technology Features for Transitways

The following technology features should be included on transitways, in addition to previous guidelines, if supporting infrastructure exists:

- *Real-time schedule information should be provided at high-volume stations through dynamic message signs (or similar technologies).*
- *Real-time park-and-ride space availability information should be provided at major park-and-ride facilities.*
- *Real-time transit travel time to general traffic travel-time comparison information should be considered for implementation near major park-and-ride facilities where transit advantages are provided.*
- *Security and safety technology systems should be incorporated into station and vehicle designs consistent with the Regional Transitway Guidelines.*

Transitways are premium, high-demand corridors where a great number of users will benefit from enhanced customer amenities. Real-time customer information at stations and park-and-rides is an emerging technology that enhances the customer experience when it is implemented. However, this technology may not be appropriate at every station or park-and-ride along a transitway and the characteristics of the service and facility may require additional analysis about the value of the technology at lower-volume facilities. In such cases, alternatives should be investigated to provide guidance to customers on how to obtain the real-time information from other available resources, if possible.

See Stations and Support Facilities Guidelines for safety and security systems at transitway stations, and there are existing fleet policies for security systems on buses. Guidelines and policies for these systems provide more detail on what is and is not expected to be included on those transitway vehicles and facilities.

9. IDENTITY AND BRANDING

9.1. INTRODUCTION

9.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway identity and branding through conversations with the technical committee, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Prior to finalizing these recommendations, the Metropolitan Council adopted an Identity and Branding Framework with input from the Identity and Branding Technical Committee and the Transitway Guidelines Advisory Committee. The document is organized into the following sections:

- Relevant background information including applicable laws and regional policies
- Existing conditions in the region and in other regions
- Adopted regional framework for transitway identity and branding
- Guidelines recommended through the technical development process

9.1.2. Committee Purpose

Branding is important to transitways because it creates a clear customer understanding and perception of the services and facilities to be offered. It offers the opportunity to create a distinct and positive recognition of a premium, high-quality service that enhances public acceptance and builds customer loyalty. Branding also can help customers navigate the transit system by providing consistent messages and customer information. Some industry research has indicated that branding alone can increase ridership by ten to 20 percent. The Federal Transit Administration (FTA) has identified branding as a required element of bus-rapid transit (BRT) service in its New Starts/Small Starts criteria.

The Twin Cities region is at a critical crossroads in transitway development. The region is quickly moving from a single operating light-rail transit (LRT) line and a single operating Commuter Rail line to a system that will include at least two operating LRT lines (and a third in design), at least two operating BRT lines, and several transitway corridors in various stages of planning. The dynamics of branding and identifying a transitway *system* are different from the branding and identifying of individual lines. The addition of BRT to the region also creates the need to distinguish transitway service from existing bus service, a need that is far less significant for rail transitway modes. As these new transitways develop, there are also immediate needs to procure vehicles for BRT lines and determine line and station names. Decisions are needed as soon as possible on how the region's transitway system will be branded in order that the branding scheme can be incorporated into the facilities that are currently being constructed and the vehicles that are about to be procured.

The primary goal of the Identity and Branding Technical Committee was to provide guidance for branding, imaging, and marketing transitway services in the Twin Cities region. The committee was tasked with reviewing and making recommendations related to identifying the target audiences, determining the "brand promise", and developing a recommended branding approach. It was not within the committee's responsibility to make recommendations related to the branding of services not operating on transitways.

9.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the Identity and Branding Technical Committee discussion include Arterial BRT, Highway BRT station-to-station, Highway BRT express, LRT, and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

9.2. BACKGROUND INFORMATION

9.2.1. Definitions

The following section defines terms applicable to the Identity and Branding Guidelines.

Brand – A brand is "the sum of all experiences, images and perceptions people have about a product, service, or company. A brand includes logos, icons, colors, fonts, product names, personality, values, heritage, reputation, functional attributes (e.g., employee/customer service, product offering, pricing, service delivery) and emotional attributes (e.g., flexible, dependable, trustworthy" (source: *APTA, Recommended Practice for BRT Branding, Imaging and Marketing,* 2008*).*

Branding – Branding is the conscious application of similar communication and identity elements to a particular product, service, or entity that is intended to identify functional attributes, differentiate, and form a personal emotional bond.

Identity – An identity is the mechanism used to broadcast "being" or existence to the public. In advertising, identity typically refers to the logos, icons, and product names that visually communicate the service/product brand to potential customers.

9.2.2. Existing Laws, Regulations and Policies

There are no existing laws or regulations that govern identity and branding of transit services.

The Metropolitan Council adopted an exterior graphic design for Northstar Commuter Rail locomotives on October 24, 2007, action item 2007-333. On March 12, 2008, the Metropolitan Council adopted additional exterior graphic designs for Hiawatha light-rail vehicles, Northstar Commuter Rail coach cars, and Metro Transit and Metropolitan Transportation Services (MTS) fixed-route buses through action item 2008-65. Finally, on July 22, 2009, the Metropolitan Council adopted exterior graphic designs for Metro Mobility and Transit Link dial-a-ride vehicles through action item 2009-224. Discussion and examples of these vehicle designs are discussed in more detail in section 9.3.2.4.

The use of red, blue, yellow, and white on all transit services provided by the Metropolitan Council, regardless of the transit operator, is intended to create a regional approach to transit branding. While most of these services are operated by Metro Transit, some services are operated by private operators and some services are provided throughout the region, such as Transit Link and Metro Mobility.

The Metropolitan Council adopted a Transitway Branding and Identity Framework on December 8, 2010 that included four important policies:

1. Position, brand, and identify LRT and Highway BRT station-to-station services in the region as one system.

2. Name LRT and Highway BRT station-to-station lines using a color-coded scheme.

3. Unify the LRT and Highway BRT station-to-station services brand using a distinct system name.

4. Apply regional transit color scheme to the LRT and Highway BRT station-to-station services in a consistent manner across the region.

The Framework is discussed in more detail in Section 9.4.

9.3. EXISTING CONDITIONS

9.3.1. Existing and Planned Transitways in the Region

Existing and planned transitways in the region are identified in the Transportation Policy Plan (TPP) and shown in Figure 9-1. Two transitways are currently operating: Northstar Commuter Rail and Hiawatha LRT. Three transitways are under construction: Central Corridor LRT, Cedar Avenue BRT, and I-35W South BRT. Several other transitways are in various stages of planning, environmental review, and/or design. All transitways, whether existing or planned, are expected to offer a high level of transit service and facilities.

A major transition is approaching, where the region will move from single lines of specific modes to a *system* of operating transitways. Thus, it is an important time to address the identity and branding of this overall system of premium services and facilities.

9.3.1.1. Transitway Services and Facilities

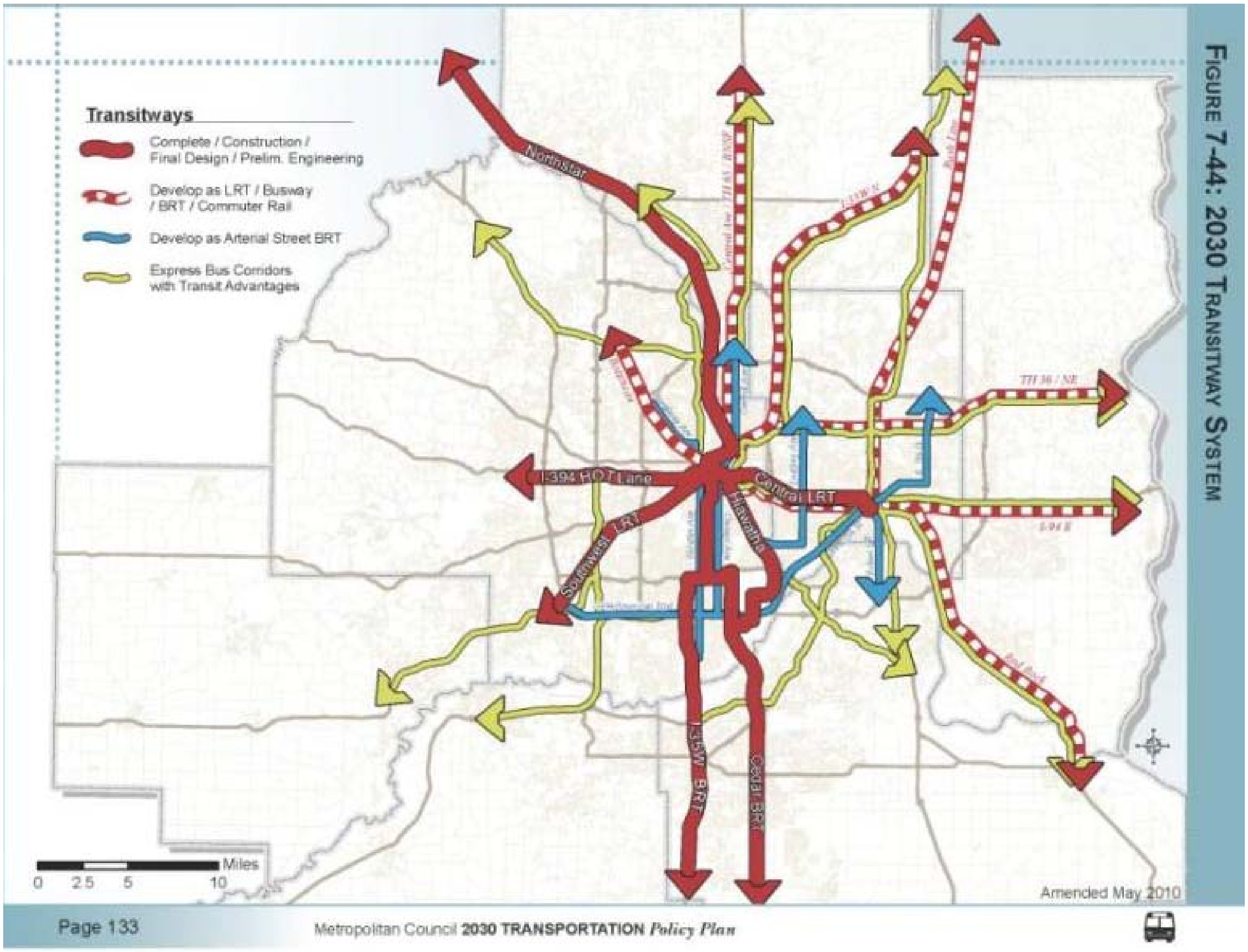
Fixed-route transit services in the Twin Cities may generally be categorized as: (1) local bus services, (2) all-day LRT and BRT services, and (3) commuter express services. The service characteristics that distinguish these services include transit speed, access (spacing of stations/stops), frequency and duration of service, and service reliability (see Table 9-1).

Metro Transit surveys potential transit riders every two years, with the last survey occurring in late 2009. Potential riders are asked which factors influence their commute decisions when considering public bus service. The most significant factors identified were (*service characteristics in parentheses*):

1. Total trip time (*speed*)
2. Arrival timeliness (*reliability*)
3. Ease of use (*frequency and availability*)
4. Number of transfers (*access*)
5. Safety
6. Wait time (*frequency and availability, reliability*)
7. Frequency (*frequency and availability*)

With the exception of safety, these factors indicate a strong recognition of speed, access, frequency and availability, and reliability as important characteristics for potential transit riders. With those considerations in mind, Table 9-1 categorizes fixed-route transit services in a way that similar services are grouped together in one of the three categories. The categories represent how important service characteristics differ (or are similar) by type of service, which factors into how a brand delivers on what it is promising to the consumer.

Figure 9-1 – Transitway System



Source: Transportation Policy Plan

Table 9-1 – Transit Service Characteristics

	Local Bus	**All-day Frequent Service** **Fast, frequent, bi-directional, all-day service**			**Commuter Express Service** **Primarily peak period, peak direction, fast commuter service to concentrated employment areas**		
	Local Bus	Arterial BRT	Hwy BRT Station-to-Station	LRT	Express Bus	Hwy BRT Express	Commuter Rail
Speed	Low	Medium	Medium-High	Medium-High	High	High	High
Access (Station Spacing)	High	Medium	Medium	Medium	Low	Low	Low
Frequency Availability	High	High	High	High	Low	Low	Low
Reliability	Medium	Medium-High	High	High	Medium	High	High

Table 9-1 illustrates several important considerations that the Identity and Branding Technical Committee used in forming their recommendations:

- Highway BRT station-to-station and LRT services promise generally the same service characteristics.
- Arterial BRT service, because of the lack of dedicated runningway, may not promise the same reliability or speed as Highway BRT station-to-station or LRT.
- Commuter Rail and Highway BRT express promise dramatically different service characteristics from Highway BRT station-to-station and LRT.

The values in Table 9-1 are simplified representations of other Transitway Guidelines Technical Committees' work including Service Operations, Station Spacing and Siting, Vehicles, Fare Collection Systems, Stations and Support Facilities, and Runningways. These service characteristics are important to existing and potential transit users, but also important to transitway implementation partners who might be branding and marketing some of these services.

9.3.1.2. LRT and Highway BRT Station-to-Station Brand Promise

LRT and Highway BRT station-to-station service is generally characterized by:

- Medium- to high-speed, reliable service created by a separated runningway and/or operational advantages

- High-frequency service typically at least every 15 minutes over at least 14 hours
- Stops that are spaced approximately ½- to one-mile apart (further apart in lower density areas)
- Strategies that encourage faster boarding
- Service that is very reliable, convenient, and comfortable
- Unique vehicles, often with distinct styling
- Stations with distinctive design providing convenient and comfortable access to transit and customer information that is often real-time information

These services and facilities constitute the technical definition of the "brand promise" for services and facilities provided by LRT and Highway BRT station-to-station transitways. A more succinct version of the brand promise may have to be developed during the formal branding of the system, as discussed in sections 9.4 and 9.5.

9.3.2. Existing Transit Identities and Branding in the Region

9.3.2.1. Existing Identities and Brands

Existing branding of transit in the Twin Cities region has four areas of focus:

- A regional system, primarily fare collection and transit information (for example, the Go-To card or MetroPass)
- A specific type of service (for example, Metro Mobility, which is the region's ADA service)
- A specific corridor or line (for example the Northstar Line or the Red Rock Corridor)
- The transit provider

Examples of the images and names that are currently being used in this region to identify and brand various transit facilities, services, and corridors in the region are shown in Figure 9-2.

Provider logos tend to play a strong role in the branding of existing transit services (see). Many service providers incorporate their website address into their branding to create a stronger awareness of this source of customer information (for example, www.metrotransit.org or www.mvta.com).

Figure 9-2 – Examples of Identities or Brands Currently Used in Twin Cities Region

Service

Light Rail

Hi-Frequency Network

Express Bus

Metro Mobility

Transit Link

Corridor

Northstar

Red Rock Corridor

Provider

Metro Transit

MVTA

SouthWest Transit

Maple Grove Transit

Plymouth Metrolink

Fare

Go-To Card

9.3.2.2. Existing Transitway Identities

Currently, transitway corridors in the Twin Cities have names in the adopted TPP. The TPP name may differ from the official corridor identity or brand and may be tied to a street or roadway (Cedar Avenue); reflect a geographic location (Southwest LRT); or neither (Northstar). The corridor brands are usually selected by the local sponsoring authority and may not reflect relevance to the region or transit users. The names and brands for individual corridors work well during planning processes, but work less well as part of a system of routes. Names often have a strong meaning for residents and businesses in that geographic area but would not be well recognized by customers who are unfamiliar with the region, community, or corridor.

9.3.2.3. Existing Station Branding & Signage

Prior to this effort, there were no existing regional guidelines for the branding and signing of transitway stations. Existing stations are usually signed with the provider's logo (for example, Metro Transit or MVTA) and customer information is provided including transit system maps and route schedules. There are no specific guidelines for the naming of stations. However, during the recent naming of the BRT station at I-35W and 46th Street, the following were identified as important criteria to consider in naming a station:

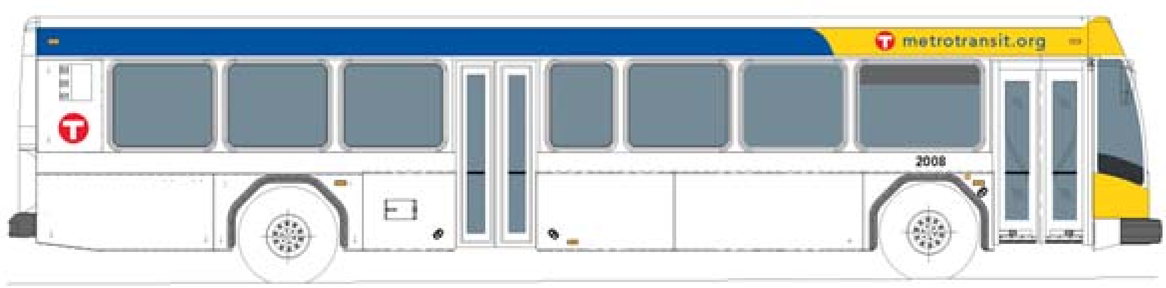
- Geographic relevance – Does the name reflect its local geography such as a major landmark and/or road?
- Public understanding – Will the name be meaningful to the general public and will potential customers know where the station is based on its name?
- Confusion or duplication – Will the name be confused with other stations or other places?
- Consistency with other stations – Is the naming consistent with other stations on the route and with the overall transit system?
- Neighborhood business preference or sensitivity – Is the name particularly agreeable or disagreeable to local neighborhood residents and/or businesses?
- Potential for naming rights – Does the station location provide an opportunity to generate revenue by selling the naming rights?

Station names can vary by service type as well. Existing Commuter Rail stations are named primarily after the community they are in (Elk River Station, Fridley Station, Big Lake Station). Light rail stations are named at a different scale, usually a local landmark or major streets (Target Field Station, Lake Street Station, VA Medical Center Station, 28th Avenue Station).

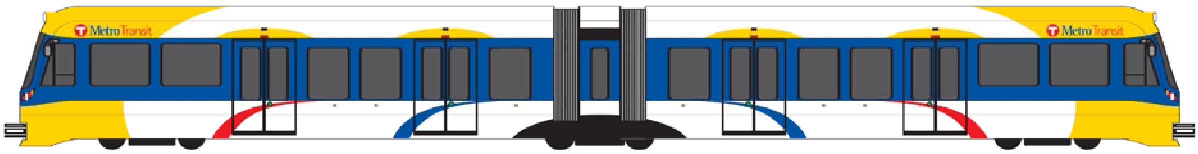
9.3.2.4. Existing Vehicle Branding

From 2007 to 2009, Metropolitan Council adopted a regional color scheme of red, blue, yellow, and white for vehicles providing transit service under the auspices of the Metropolitan Council. This includes all services operated by Metro Transit as well as services operated by private operators under contract to the Metropolitan Council. These colors are or will be used on all Commuter Rail, light rail, express and regular route buses, and dial-a-ride services such as Metro Mobility and Transit Link. The paint scheme varies for each service provided (see Figure 9-3) but the colors used remain consistent. The Metro Transit logo and www.metrotransit.org also play a prominent role in vehicle branding for all services operated by Metro Transit. Suburban transit providers have their own unique color schemes and these color schemes, along with the provider logo, are dominant in vehicle branding for each provider's services.

Figure 9-3 – Existing Vehicle Branding in the Twin Cities Region

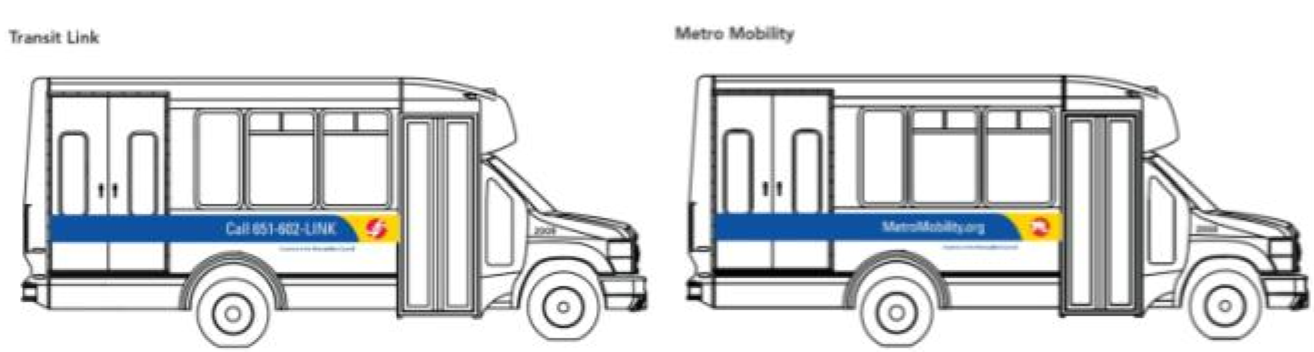


Metro Transit Local/Express Bus



Light Rail Transit Vehicle Branding

Northstar Commuter Rail Branding



Metro Mobility/Transit Link Vehicle Branding

Minnesota Valley Transit Authority Vehicle Branding

9.3.3. American Public Transit Association Guidance

The American Public Transit Association (APTA) has produced draft recommended practice guidance on branding, imaging, and marketing BRT[1]. With the assistance of 28 national practitioners, the document draws upon best practice experience from around the country, other related research, and expertise from the practitioners. The following is a summary of key points from the document.

[1] Insert APTA Reference

9.3.3.1. The Role of Branding in BRT Service

Branding BRT service with a distinct identity can positively affect the public acceptance of the service. According to the document, a brand can also deliver the following public transit benefits:

- Clearly differentiated transit service: Branding can create a premium, higher-quality rapid transit feel for a BRT service, distinguishing it from standard or more conventional services.
- Enhanced outreach efforts: A common brand proposition among the various components of a BRT system will simplify marketing efforts and will allow a transit agency to more effectively reach its target customers.
- Increased customer loyalty: A consistent brand identity will help customers navigate the system by making the BRT system easily identifiable and distinguishing it from other services. Consistent delivery of the brand promise will create loyal customers.
- Improved employee satisfaction and retention: A consistent and compelling brand creates pride and a sense of contribution for employees.
- Increased brand value, as measured by added revenue and increased market share.
- Potential for attracting development activity: An attractive and compelling brand can help attract new economic development or intensify existing land uses around the BRT corridor.

All of these benefits can result in increased ridership and increased awareness of public transit services, which have additional system-wide benefits.

9.3.3.2. Brand Promise

A brand promise is the basis for developing a consistent outreach effort to the consumer through marketing, identity, and branding. The document summarizes the brand promises of several BRT services in the United States, included as Table 9-2. Brand promises are generally succinct messages to the public that communicate the benefits of the service.

Table 9-2 – Brand Promises and Messages of BRT Services

City	Service	Features	Brand promise/ attributes	Comments
Boston	Silver Line	Mixed and dedicated roadway and tunnel operations; some LRT-type stations	Part of rail network, quality	Also generates significant land-use development around stations.
Cleveland	HealthLine	Dedicated and mixed roadways; precision docking stations, doors on both sides	Fast, safe, first class, “rail like”	Original brand name was “Silver Line.” Naming rights were sold to a major health care institution.
Eugene, Or..	EmX	Dedicated lanes, bi-directional in places, stations, attractive landscaping, dedicated & distinctively designed vehicles	Fast, environmentally friendly	EmX is short for “Emerald Express” (Eugene is known as “the Emerald City”).
Everett, Wa.	Swift	Dedicated lane, stations	Fast, environmentally friendly	Use of bird logo taps into the environmental ethic of the U.S. Northwest.
Kansas City, Mo.	MAX	Arterial BRT	Fast, frequent, convenient, stylish	
Los Angeles	Metro Rapid	Arterial BRT	Faster, more frequent	Sales slogan “Fast. Frequent. Fabulous.” taps into L.A. ethos.
Los Angeles	Orange Line	Dedicated roadway, light rail-like stations, dedicated & distinctively designed vehicles	Part of rail network	Color chosen to reflect citrus heritage in valley.
Las Vegas	MAX	Arterial BRT	Faster, glitzier, futuristic	Use of the MAX acronym connotes “maximum” service.
Pittsburgh	Martin Luther King Jr. East and West Busways	Dedicated roadway, distinct station design, linear park along East Busway	Fast, frequent, flexible service	Significant development at several stations on East Busway

9.3.3.3. Brand Implementation

After a brand promise has been established, the various components of branding BRT service need to implemented. The document does a good job summarizing these components:

- Name of service and lines
- Color schemes, graphics, and logos
- Elements of the BRT system
- Operating features and performance
- Customer information such as signage, maps, and schedules
- Publications, media, public relations, and marketing information
- Employee selection and training

While the document does not go into significant detail about the link between rail and BRT systems, it does include this brief statement:

> *"In regions with rail service, the BRT system can be closely branded or identified as an extension of the rail or other family of services. In regions with only bus service, the BRT system can be branded or identified as a typical rail system would be: to identify it as a premium service."*

There are several examples of how this is managed in regions around the country and many of those examples are included in section 9.3.4. The examples do illustrate that rail and BRT service can be linked through line and service naming. The following section examines these concepts in more detail.

9.3.4. Existing Conditions in Other Regions

9.3.4.1. System Service Types

There are a number of regions around the United States that have implemented BRT services. However, unlike the Twin Cities region, few regions have both LRT and BRT in operation. Below is a summary of key aspects of transitway systems in other regions.

<u>Bus-only system</u> – In regions with bus-only transitway systems, the BRT service is clearly distinguished from the regular bus service through branding and identity.

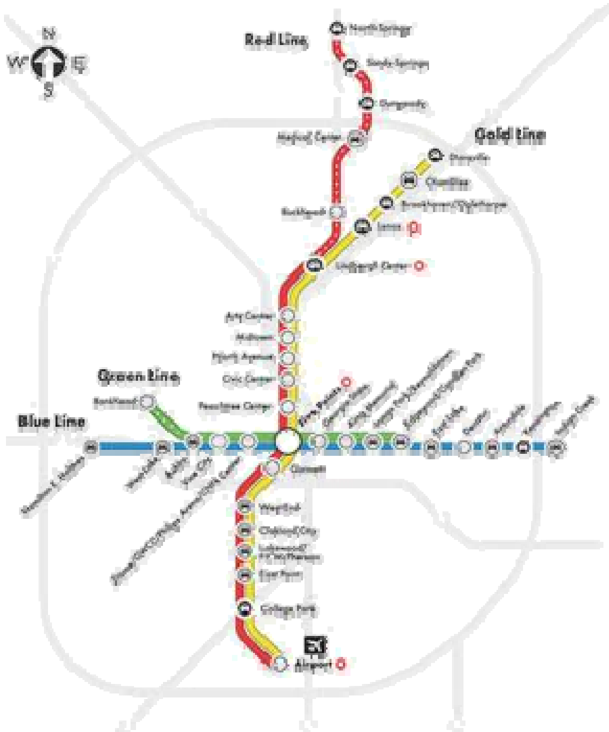
<u>Rail-only system</u> – In regions with rail-only transitway systems, such as Atlanta, the service is branded distinctly from regular bus service.

<u>Bus and rail system</u> – In regions with both rail and BRT transitway systems, the two systems can link together, but typically only when they are promising similar services expectations.

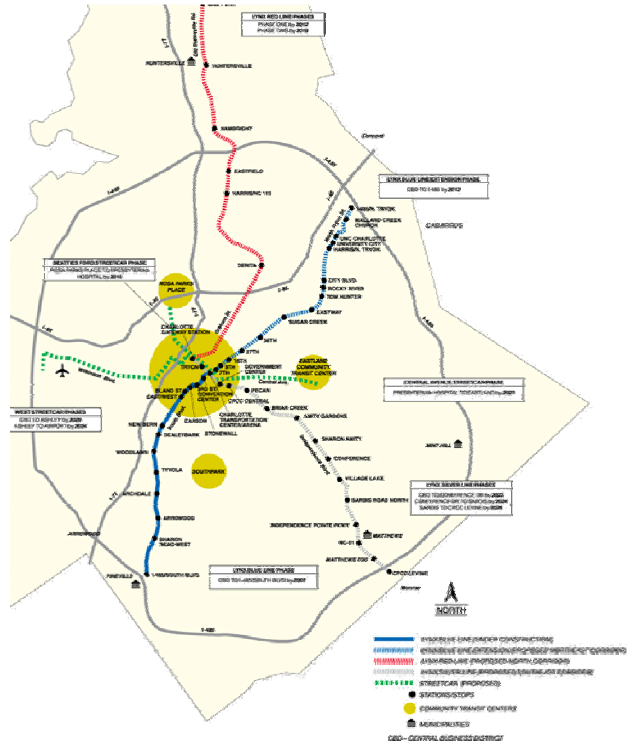
9.3.4.2. Line Identity

The identification of transitway lines is an important component of customer interaction. The majority of regions examined identify transitway lines with colors. Figure 9-4 illustrates the variety of applications for line identity that exist in the United States across a diverse set of transitway system types (described above).

Figure 9-4 – Examples of Line Identity in Other Regions



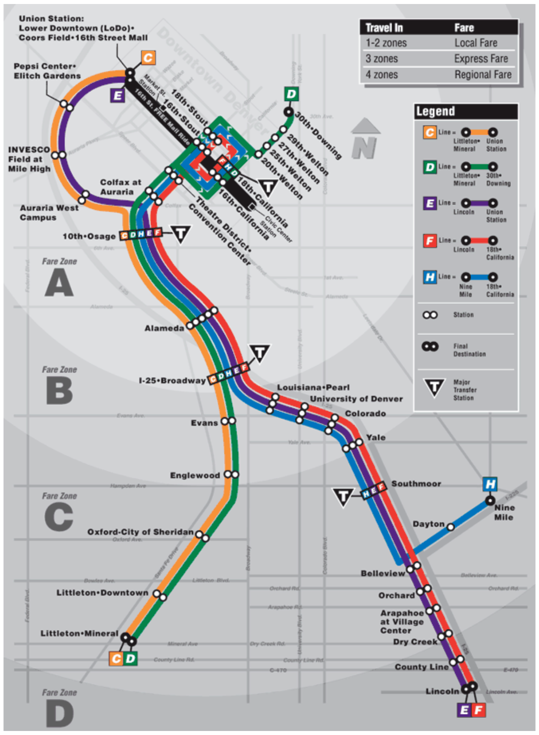
Atlanta, GA



Charlotte, NC

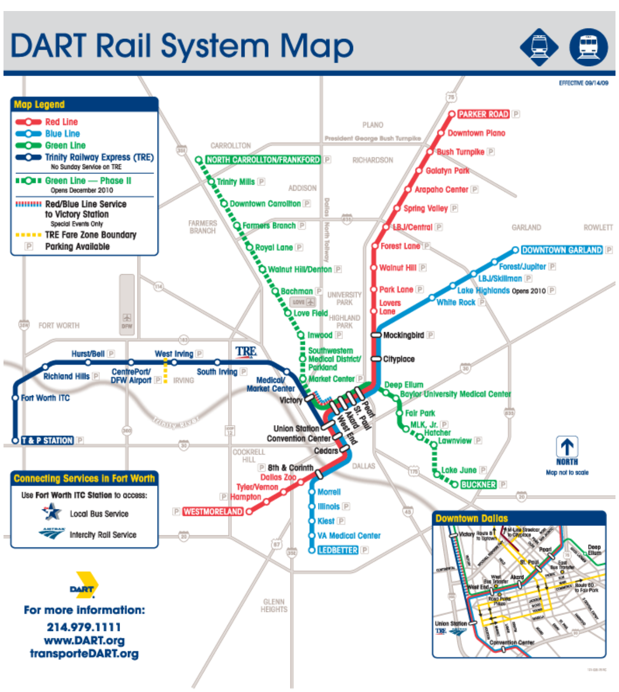
Boston, MA

Cleveland, OH



Denver, CO

San Diego, CA



Dallas, TX

Los Angeles, CA

In many ways, the complexity of transitway service dictates how lines are identified. For instance, in Denver and Portland, the LRT systems utilize multiple endpoints for lines along the same "corridor". For these lines, separate colors are applied to indicate the varying destinations of each line. In Atlanta and Dallas, the lines all through-route downtown so that a line identity remains the same regardless of which "corridor" into downtown a transit rider is departing from. Boston has a unique system of color lines that includes both rail and BRT, and several of the lines have branches where outbound trips are identified by both a color and a destination. The destination identification can serve as a line identity and/or a direction identity (northbound/southbound, inbound/outbound, etc.). Cleveland identifies both rail and BRT as part of their rapid-transit network but they utilize unique naming rights for the BRT service, as opposed to a color like the rail lines.

Several regions have transitioned from line names to line colors after a system was already in operation or implementation. Atlanta did so in 2009[2], Portland transitioned the MAX LRT system in 2001, and Cleveland changed the name of the Silver Line (BRT) to the HealthLine when naming rights were sold just prior to the service opening.

While there is no universal theme for transitway line identity among United States transit systems, the use of colors as line identities is the most featured approach. Even in regions that use other approaches (i.e. Denver with letters), colors are still utilized in mapping and other forms of customer information.

9.3.5. System Branding

Transitway systems are important to distinguish from other transit services because they are premium services that deliver different promises to the consumer. This can be achieved through line naming (see above) or system branding, or a combination of both. Similar to line naming, this has been approached in a variety of ways throughout transit systems in the United States. Table 9-3 illustrates some examples of system brands that have been created for transitway services in other regions.

Table 9-3 – System Branding in Other Regions

Region (Transit Agency)	LRT/Rail	BRT/Busway
Portland (Tri-Met)	"MAX"	-
Pittsburgh (Port Authority)	"T"	Busway
Los Angeles (Metro)	"Metro Rail"	"Metro Rapid" "Metro Transitway"
Salt Lake City (UTA)	"TRAX"	"MAX"
Kansas City (KCRTA)	-	"MAX"
Denver (RTD)	"The Ride"	-
St. Louis (Metro)	"Metrolink"	-
Boston (MBTA)	"T"	
Cleveland (RTA)	Rapid transit system	
San Diego (MTS)	Trolley	"Super Loop"
Seattle (Metro, Sound Transit)	"Link"	"RapidRide"
Snohomish Co. (Community)	-	"Swift"

The majority of regions examined utilized some form of system branding for their transitway services. The names vary in their application and purpose, but they are consistent in distinguishing the transitway services from other services in each region. Names like "Link", "MAX", and "RapidRide" provide the

[2] http://www.itsmarta.com/color-coded-rail-line.aspx

user with some indication of what the service promises, while names like "Metro Rail" or "The Ride" are less indicative of the service promise but still unique.

Figure 9-5 and Figure 9-6 include examples of how system brands are incorporated into station and vehicle designs.

Figure 9-5 – System Branding of Stations in Other Regions

Kansas City, MO – "MAX" BRT

Community Transit, WA – "Swift" BRT

Boston, MA – “T” Rail

Figure 9-6 – System Branding of Vehicles in Other Regions

Kansas City, MO – “MAX” BRT

Community Transit, WA – “Swift” BRT

Eugune, OR – “EmX” BRT

Seattle, WA – “Link” LRT

Portland, OR – “MAX” LRT

9.4. BRANDING FRAMEWORK

The Identity and Branding Committee developed recommendations for two purposes. The committee generally agreed that an overall framework for branding transitways should be identified and approved by the Metropolitan Council prior to the development of guidelines for the implementation of that Branding Framework. The recommendations in the Branding Framework are significant regional decisions that required input and action from the Metropolitan Council. The Technical Committee discussed and developed guidelines as much as possible during the Framework approval process.

It was agreed early on that there are important benefits to branding, supported by the practice and benefits demonstrated in other regions, technical guidance, and regional experience. Branding helps to clearly differentiate transit service types; it enhances marketing and outreach efforts; it makes the system easier to use; and it creates loyal customers. This section of the technical memorandum documents the Branding Framework that was developed and recommended with input from both the Identity and Branding Technical Committee and the Transitway Guidelines Advisory Committee.

9.4.1. Brand Position

Position, brand, and identify light-rail transit (LRT) and highway bus-rapid transit (BRT) station-to-station services in the region as one system.

Both the Identity and Branding Technical Committee and the Transitway Guidelines Advisory Committee agreed that LRT and Highway BRT station-to-station services are intended to provide a premium, all-day service that operates at least every 15 minutes for at least 14 hours a day with high quality transit facilities and customer information. Both services are intended to be fast, frequent, and reliable – in effect, a service that can be easily used without needing a printed schedule. These service and facility characteristics make up the basis for the brand position, which is very similar for LRT and Highway BRT. Thus, both groups recommended that LRT and Highway BRT station-to-station service be positioned and branded as a single system of premium all-day services. It was also recommended that:

- Commuter Rail not be included in this system because it is a peak-period express service and has been frequently confused with LRT, which is an all-day service.
- Arterial BRT has an unclear role in these branding decisions because the service attributes of Arterial BRT will likely be somewhat different than LRT and Highway BRT station-to-station services. This issue should be revisited after the Arterial Transitway Corridors Study has been completed.

9.4.2. Line Name

Name LRT and Highway BRT station-to-station lines using a color-coded scheme.

The Identity and Branding Technical Committee addressed the following questions while considering a recommendation for a LRT and Highway BRT station-to-station naming scheme:

- How will the service operate – Can the naming scheme accommodate through-routing and interlining?
- Can the naming scheme accommodate service expansion?

- Is the naming scheme easy to remember and understand, particularly for people not familiar with the region, the transit system, or individual corridors?
- Does the line identity have to be compatible with other transitway components to be branded?
- What have other regions done and why?

The committee discussed a number of different line naming schemes including place-based, color-based, letter-based, corridor-based, service-based, and several combination schemes. It was determined, after a review of many other regions and a thorough discussion of the above issues that *lines* rather than *corridors* needed to be identified and named, primarily because LRT lines and Highway BRT station-to-station services will eventually be through-routed between transitways for operating efficiency. For example, it is assumed that Southwest LRT service will be through-routed with Central Corridor LRT service to optimize use of the tracks along 5th Street in downtown Minneapolis. A line-based naming scheme is also easier for customers to understand, particularly those who are not familiar with the region or the corridor and more clearly indicates when transfers between lines are required. It was also agreed that the system of LRT and Highway BRT station-to-station lines should be identified using a *color-coded* scheme. An example of color-coded route lines, based on corridors currently in implementation with a locally preferred alternative (LPA) selected, is shown in Figure 9-7. This approach was selected for the following reasons:

- Color is the most common scheme used in other regions and, therefore, is most understandable for users unfamiliar with the region.
- Color allows LRT and BRT vehicles to be easily through-routed and service to be easily expanded without resulting in confusing names or renaming of existing corridors. In addition, new lines could be created that utilize existing infrastructure but serve different destinations.
- Color is easily translated to maps and other customer information.
- Color is easy to understand and has no language barriers. However, the written name of the color should be used in addition to the actual color to address issues of color-blindness.

Similarly to the Brand Position, the committee recommended that Commuter Rail be identified using a different scheme (most likely using corridor names, as is done today) because it is a peak-period express service, not an all-day service like LRT and BRT. The committee also recommended that Arterial BRT lines be identified as a system but not be included in the color-coded system of line names because the service characteristics are different from LRT and Highway BRT.

Figure 9-7 – Example of Color-Code Line Names (Illustrative Only)

9.4.3. System Name

Unify the LRT and Highway BRT station-to-station services brand using a distinct system name.

The Identity and Branding Technical Committee discussed, at length, whether it was desirable to create a name and logo that would identify LRT and Highway BRT station-to-station service as a unique service. As discussed previously in this technical memorandum, the committee agreed that LRT and Highway BRT station-to-station services have similar characteristics and that it would be beneficial to align Highway BRT station-to-station service with LRT through branding. While the committee reached an agreement that a system name was desirable, it did not arrive at a recommendation for a specific name and/or logo for these services. A system name recommendation was made for the following reasons:

- A system name and identity will reinforce the message that LRT and Highway BRT station-to-station services have similar attributes and will help to solidify the value of BRT to the general public.
- A system name will help to unify the LRT and Highway BRT station-to-station services and emphasize system connectivity.
- A system name will provide a consistent message to the public that both LRT and BRT are **premium** services.
- It is common practice in other regions to brand a system of transitways as unique services within a regional system.

In making this recommendation, the committee also recommended that the brand not *over promise* and that the brand should be unique from other regional services. It should also be noted that provider names and logos will still be used but should be subservient to the LRT and Highway BRT station-to-station system logo/name.

9.4.4. System Colors[3]

Apply regional transit color scheme to the LRT and Highway BRT station-to-station services in a consistent manner across the region.

As noted earlier in this technical memorandum, the Metropolitan Council has already adopted a regional color scheme for transit services provided by the Metropolitan Council. The color scheme includes yellow, blue, red, and white and is applied differently depending on the type of service (refer to Figure 9-3 for examples). This color scheme is currently utilized on LRT vehicles and facilities, on Commuter Rail vehicles and facilities, and on all buses and transit facilities provided by the Metropolitan Council, whether operated by Metro Transit or other private transit operators. The Identity and Branding Technical Committee did not make a recommendation on a transit color scheme but the Transitway Guidelines Advisory Committee recommended that the regional color scheme be incorporated into the transitway branding framework. The regional color scheme should be applied in a unique manner to support the branding of LRT and Highway BRT station-to-station as unique and premium all-day services. This recommendation was made for the following reasons:

- Using the regional color scheme reinforces the customer message that the region's transit system is integrated and all elements of the system can be used in a transparent manner (similar to the region's fare system and Go-To Card).
- Using a different application of the same colors allows for a unique identity of LRT and BRT services while still demonstrating the linkage of these services to other transit services in the region.
- Existing transitway services are already utilizing the regional color scheme, as is over 90% of the overall regional transit system.

[3] *9.4.4 is a result of feedback from the September Transitway Guidelines Advisory Committee and discussion at the Identity and Branding Technical Committee. It was not included in the Technical Committee recommendation on the Framework.*

9.5. IDENTITY AND BRANDING GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff the following Identity and Branding Guidelines are recommended for adoption. These guidelines should be considered collectively when making identity and branding decisions for transitways. The guidelines are summarized and discussed below.

9.5.1. Integrated Branding and Identity Scheme

The branding and identity scheme that is developed for Light-Rail Transit (LRT) and Highway Bus-Rapid Transit (BRT) station-to-station services will be integrated and reflected on all system components including stations, vehicles, signage, and customer information.

The integration of the branding scheme is important for customer clarity throughout the system. This will reinforce the brand message that LRT and Highway BRT station-to-station services are **premium** services offering a similar level of transit service and transit facilities. Research indicates that transitway services should be branded wherever they serve, even if other services exist at the same location. A balance needs to be struck between transitway services and other services, when present.

The branding and identity scheme includes the line name, system name, system colors, maps, and other components that may be developed to unite the LRT and Highway BRT station-to-station services.

9.5.2. Line Colors

Line colors should be selected with input from the impacted communities through the corridor policy advisory committee but still need to be distinct from one another, fit within the regional transitway system, and allow for line through-routing. As a result, line colors are ultimately a Metropolitan Council decision. Commonly known, simple colors are preferred (red, blue, green, orange, etc.).

Given the unique, limited market (express) for Commuter Rail services, Commuter Rail lines should be identified with a unique name chosen by the lead agency in consultation with partnering agencies. Commuter Rail line names should not directly conflict with the line or system names developed for LRT and Highway BRT station-to-station services.

The desire for community input in corridor naming decisions is an important component of the branding process. However, naming decisions need to be weighed against regional context and system-wide integration. For LRT and Highway BRT station-to-station, community input on which color will be used to identify a line should be sought, recognizing that it may be limited by the systematic approach based on colors. The Council will generally assign color lines once a locally preferred alternative is adopted for a transitway.

Commuter Rail lines represent significant regional investments and should be identified uniquely in the system. Their market is more localized (thus, less regional) than LRT and BRT and as a result, community involvement can play a more significant role in determining a line name. National practice indicates that Commuter Rail names are usually tied to the communities they serve, specifically the outbound endpoints, or to a unique corridor name, like a geographic feature (valley, river, coast, etc.).

Arterial BRT lines should be identified as a premium service, but the details behind the service are not developed enough at this time to specify the role of branding in the regional transit system. The Arterial

BRT corridors should not be branded with the color-coded line system because the service attributes are different from LRT and Highway BRT station-to-station services. However, a line-naming scheme specific to Arterial BRT could be developed and added to these guidelines after the Arterial Transitway Corridors Study is complete and more is known about how the services will interact with local bus and other transitway services.

9.5.3. Station and Signage Branding

The most important aspects of the branding and identity at transitway stations are the system brand, line identity, and station name and these aspects should be included at each station. At each station, transitway/system brands take precedence over provider brand. Though less important, provider brands may be present because they are important for customer information and other services.

System brand elements for all LRT and Highway BRT services should be consistent and visible at all stations.

The application of branding at stations can be complicated because a number of messages need to be communicated to the customer. Most importantly, signage at stations needs to communicate location to the customer, as well as what services are provided at that station. Signs at each platform should indicate which direction the service is heading (inbound/outbound, eastbound/westbound). Information about the line(s) that are served by that station and the geographic location of the station needs to be provided and prominent. In addition, information needs to be provided about connecting transit routes and any other services that are provided at that station.

Transitway stations should be distinct and appealing in their design, and their design will become a part of the overall branding of the transitway system. It is expected that there will be consistency in the architectural design of stations along an individual transitway corridor, but that each corridor may have its own architectural character. However, more information about station design is provided in the Stations and Support Facilities recommendations.

9.5.4. Vehicle Branding

The most important aspects of the branding on transitway vehicles are the system brand, line name/route identity, and customer information and these aspects should be included on each vehicle. System and transitway brands take precedence over provider brands on each vehicle. BRT vehicles should have a unique paint scheme, using the regional system colors, that distinguishes them from other regular route and express buses in the region.

LRT and Commuter Rail are branded, in part, by the vehicle that provides the transit service. Buses providing Highway BRT station-to-station or Arterial BRT service will likely also have some unique characteristics that will distinguish them from other buses in the transit system. However, the most important distinguishing element for buses will likely be the branding.

The most important information required on transit vehicles are the type of service (system brand), the line or route (primarily through changeable message signs), and where users can go to get more information (customer information). The last component is important because transit vehicles move throughout the region and, essentially, act as marketing mechanisms for transit services. The unique design or look of transitway vehicles is intended to draw in atypical transit users who may not be familiar with where additional transit information is available.

9.5.5. Station Naming

Transitway station names should be selected based on the criteria listed below. Station names will be selected with input from the lead agency or impacted communities but are ultimately a Metropolitan Council decision:

- *The name should reflect local geography (cross-street or major landmark).*
- *The name should be easy for the general public to recognize, particularly potential customers who are not familiar with the region and/or the corridor.*
- *The name should be distinct from the names of other stations to the extent feasible so that the name does not create confusion for potential customers or emergency responders.*
- *The name should be succinct and the use of two names for one station should be avoided.*
- *When station naming rights are sold, the resulting station name must continue to have a clear link to a nearby landmark or regionally recognizable destination. If a station name is sold, the sale should be for a period of at least 20 years and the price should be based on market exposure.*

The primary purpose of a station name is to provide a geographic reference for customers to know where to access the transit system for boarding and alighting. However, stations also have the potential to become a focal point for an existing neighborhood, a business district, and/or an emerging transit-oriented development. Sometimes there may be an opportunity to increase revenue by selling the name of a station to a nearby enterprise. Regional guidelines are needed in order to provide consistency throughout the transitway system, to insure that station names are not confusing or duplicative, and to insure that customer service remains a priority when stations are named. Priority should be given to names that have a clearly and broadly understood geographic reference.

9.5.6. Customer Information

Signage, maps, and schedules for transitway service should reinforce the unique and premium statuses of the services. Signs, system maps, and schedules should be designed to be simple and easy-to-understand.

All materials prepared to support LRT and BRT services should be coordinated with the system-branding framework (system logo, system colors, graphical elements, etc.). Information technology, such as real-time passenger information signs, should also be designed to support the transitway branding framework. If multiple providers are operating service along a transitway, those services should be incorporated into all transitway marketing and customer information materials. Provider/operator logos should be incorporated into these materials but should not be a dominant feature.

9.5.7. Advertising

The potential for advertising should not be precluded in the design of stations, shelters, and/or vehicles. Customer information requirements should always be given priority over advertising. BRT vehicles should only include advertising if it does not interfere with the vehicle brand, which is an integral element in distinguishing it from regular bus service.

Advertising at stations and shelters, advertising on vehicles, and the selling of station naming rights are all potential sources of revenue. Thus, it is important that the opportunity for generating advertising revenues should not be precluded in the design of stations, shelters, or vehicles. However, wrapping of BRT vehicles should be avoided in early stages of implementation, as it would likely interfere with Guideline 9.5.4. Vehicle Branding. The same would apply to rail vehicles; however, they are less likely to be confused with other services in the region so more flexibility would be appropriate. Issues such as visibility, ease of maintenance, and appropriate content should also be considered when designing stations and shelters and making decisions on proposed advertising.

10. PROJECT DEVELOPMENT, LEADERSHIP, AND OVERSIGHT

10.1. INTRODUCTION

10.1.1. Chapter Introduction

This document summarizes the basis and rationale for the Regional Transitway Guidelines recommended for transitway project development, leadership, and oversight through conversations with the technical committees, Advisory Committee, and Metropolitan Council and Metro Transit senior staff. Following the introduction, the remainder of this document is organized into the following sections:

- Relevant background information including applicable laws, regional policies, and funding programs
- Existing project development, leadership and oversight and funding practices
- Existing transit operations
- Transit ridership forecasting
- Capital investment criteria
- Guidelines recommended through the technical development process

10.1.2. Committee Purpose

The organizational structure and the associated laws related to the delivery of public transit facilities and services in the Twin Cities region are complex and have evolved over several decades. There are multiple agencies involved in the funding, planning, design, construction, operation, and maintenance of transit facilities and services. As part of the Regional Transitway Guidelines, the objectives of the Project Development, Leadership and Oversight (PDLO) Guidelines are to support:

- Effective coordination among multiple agencies/entities involved in funding and implementation
- Simple, efficient and consistent organization for all steps in the project development process
- A clear decision-making process at both staff and policy levels
- A shared understanding of roles and responsibilities for each stakeholder
- Legal and funding requirements
- Effective stakeholder and public involvement
- The best use of available resources at all levels of government, including the interests, skills and resources of all partners
- Quality outcomes

Funding is a very important, if not the most important, component of transitway development. The availability and amount of funding will often determine the feasibility, timing, and degree to which a transitway project can be built. Transitway funding, however, is a difficult subject for which to develop guidelines, in that most transitway funding sources already come with specific rules and requirements guiding the use of the funding. In addition, to the degree that funding does not have specific requirements, it does not appear to be in the region's best interest to impose additional rules that may inhibit the use of the funding and the development of transitways. The Funding Technical Committee discussed these issues in detail and determined that rather than developing "Funding Guidelines", it would be more appropriate and useful to:

- Document existing funding sources and programs;
- Build a shared understanding of existing funding rules, practices and assumptions; and
- Clarify roles and responsibilities related to transitway funding.

As a result, discussion and information relating to the issues above have been incorporated into this chapter, where overall project roles and responsibilities, including funding, are discussed in more detail.

10.1.3. Transitway Modes

There are five transitway modes included in the scope of the Regional Transitway Guidelines 2010 effort. The modes included in the PDLO and Funding technical committee discussions include Arterial Bus-Rapid Transit (BRT), Highway BRT station-to-station, Highway BRT express, Light-Rail Transit (LRT), and Commuter Rail. See Chapter 1 for a summary of the characteristics of the modes. These modes are intended to provide a level of service along transitways that is at least 20 percent faster than local bus service with a high level of reliability and a high quality of transit facilities.

10.2. BACKGROUND INFORMATION

This section of the report addresses existing transitway laws and regulations related to project development, leadership and oversight and project funding.

10.2.1. Existing Laws and Regulations

The following section summarizes the existing laws and requirements related to transitway implementation. This section does not cover all local, state, and federal laws or regulations that are relevant to transitways, but rather just those relevant to the issues addressed by the PDLO and Funding committees.

10.2.2. General

Transitway Modes - Minn. Stat. 473.399, subd.1 states that transitway modes may include BRT, LRT, Commuter Rail, or other available systems or technologies that improve transit service.

Integrated Transportation System - Minn. Stat. 473.399, subd.1a requires an integrated transportation system in the region, including transit.

10.2.3. Commuter Rail

Responsible Authority - Minn. Stat. 174.82 makes the commissioner of the Minnesota Department of Transportation (Mn/DOT) responsible for all aspects of planning, developing, constructing, operating, and maintaining Commuter Rail, but the commissioner can delegate the authority to a public or private entity, including a regional railroad authority, a joint powers board, and a railroad and to the Metropolitan Council per Minn. Stat. 473.4057.

Minn. Stat. 473.4057 requires the Metropolitan Council to operate and maintain commuter rail facilities located whole or in part in the metropolitan area.

Also under Minn. Stat. 473.4057, after commencement of revenue service, the Metropolitan Council is responsible for subsequent planning, development, acquisition, construction, and equipping of improvements in that corridor.

Commuter Rail Planning - Minn. Stat. 174.84, subd. 2 requires the state's Commuter Rail system plan be approved by metropolitan planning organizations in areas in which Commuter Rail will be located before the commissioner may begin final design of rail facilities.

Minn. Stat. 174.84, subd. 4 requires that Commuter Rail be planned, designed, and implemented in such a way as to move transit users to, from, and within the metropolitan area, and to provide a unified, integrated, and efficient multimodal transportation system.

Minn. Stat. 174.86 defines the Commuter Rail corridor plan review process including city, county, and town approval, and metropolitan planning organization plan consistency review.

Minn. Stat. 174.86, subd. 5 requires a corridor coordinating committee for planning, design, construction, and service of a Commuter Rail line and specifies the composition of the committee.

Funding Stipulations - Minn. Stat. 174.88, subd. 2 states, among other things, that the commissioner shall not spend state funds to study Commuter Rail unless the funds are appropriated in legislation that identifies the route, including origin and destination.

10.2.4. Light-Rail Transit

Responsible Authority - Minn. Stat. 473.3994, subd.1a requires the governor to designate either the Metropolitan Council or Mn/DOT as the responsible entity for LRT planning, design, right-of-way acquisition, construction, and equipment.

LRT Planning - Minn. Stat. 473.3994 defines the LRT corridor plan review process including city, county, and town approval, and metropolitan planning organization plan consistency review (when Mn/DOT is the responsible authority).

Minn. Stat. 473.3994, subd. 10 requires a corridor management committee for design and construction of LRT and specifies the composition of the committee.

10.2.5. Bus-Rapid Transit

Cedar Avenue Corridor - MN Session Laws 2005. 1st Special Session chapter 6. Section 90 allows the Dakota County Regional Railroad Authority (DCRRA) the authority to develop BRT in the Cedar Avenue transit corridor:

"Dakota County Regional Railroad Authority may exercise the powers conferred by Minnesota Statutes, section 398A.04, to plan, establish, acquire, develop, construct, purchase, enlarge, extend, improve, maintain, equip, operate, regulate, and protect a bus-rapid transit system located within the Cedar Avenue transit corridor within Dakota County."

10.2.6. Transit Funding Sources and Programs

The following section highlights transit and transitway funding programs available under existing federal and state laws. Table 10-1 provides a summary of the information including a listing of the potential funding sources, approximate amount available annually, a summary of how the funds are made available, and requirements governing how the funds may be used.

10.2.6.1. Federal Transit Funding

New Starts (5309) – New Starts funding may be used for new or extended fixed-guideway transit system projects. A project is only eligible for New Starts funding once it has entered the preliminary engineering phase of development. The funding may only be used on projects approved through the New Starts application and approval process. A minimum local match of 20 percent is required for all New Starts funding. Current federal policy has limited annual funding from the New Starts program to $95 M.

Small Starts (5309) – Small Starts funding may be used on new or extended transit system projects that are fixed guideway for at least 50 percent or bus projects with ten/fifteen minute headways. A project is only eligible for Small Starts funding once it has entered the preliminary engineering phase of development. The funding may only be used on projects approved through the Small Starts application and approval process and requires. A minimum local match of 20 percent is required for all Small Starts funding.

Bus Capital Improvements (5309) – Bus Capital Improvements funding may be used for bus capital and preventative maintenance projects. Rail capital projects are not eligible for this funding. The funding is provided through congressional earmarks and varies in amount from year to year. The Metropolitan Council or Mn/DOT serves as the designated federal recipient for these funds and, if awarded to another regional entity, acts as the fiscal oversight agency. A minimum local match of 20 percent is required for all Bus Capital Improvements funding.

Urbanized Area Formula (5307 & 5340) – Urban Area Formula funding may be used for transit system replacement and expansion, capital purposes, preventative maintenance, and the capital costs of contracting. Non-transit capital projects are not eligible for this funding. The Metropolitan Council is allocated the Urban Area Formula funds through a federal formula and allocates funds to specific projects in the region through the annual development of the Council’s six-year Capital Improvement Plan (CIP). The Twin Cities region typically receives an estimated $50 million annually in Urbanized Area Formula funding (per 2010 data). A minimum local match of 20 percent is required for all Urban Area Formula funds.

Fixed Guideway Modernization (5309) – Fixed Guideway Modernization funding may be used for capital and preventative maintenance on fixed guideway projects, including BRT on exclusive or high-occupancy vehicle (HOV) lanes and bus-only shoulders. Non-fixed-guideway projects are not eligible for this funding. The Metropolitan Council is allocated the Fixed Guideway Modernization funds through a federal formula and allocates these funds to specific fixed-guideway projects through annual development of the six-year CIP. The Twin Cities region typically receives an estimated $13.6 million annually in Fixed Guideway Modernization funding (per 2010 data). A minimum local match of 20 percent is required for all Fixed Guideway Modernization funding.

Alternative Analysis (AA) (5339) – Alternative analysis funding may be used on a transit project during the alternative analysis phase of development, until the selection of the locally preferred alternative (LPA). The spending of the AA funding must be completed by the project’s entry into the preliminary engineering (PE) phase of development. Alternative analysis funding is provided through congressional earmarks and varies in amount from year-to-year. A minimum local match of 20 percent is required for all AA funding.

Congestion Mitigation and Air Quality (CMAQ) – Congestion Mitigation and Air Quality funding may be used on transit capital and operating expansion. Existing transit operations and capital are not eligible for CMAQ funding. CMAQ funding is distributed in the region through a regional solicitation process led by the Transportation Advisory Board (TAB) and its Technical Advisory Committee (TAC). The

Twin Cities region typically receives an estimated $25 million annually in CMAQ funding (per 2010 data). The regional solicitation process limits projects to a maximum of $7.0 million and allocates these funds four years in advance of expected expenditure (i.e. 2011 solicitation is for funds in 2015 and 2016) though recipients can choose to advance construct projects and be reimbursed in the award year. A minimum local match of 20 percent is required for all CMAQ funding.

Surface Transportation Urban Program (STP-U/STP-Urban) – Surface Transportation Urban Program funding is primarily used for road construction purposes, up to $7 million per project. In order to be eligible for funding, a project must meet the solicitation category requirements. STP-Urban funding is distributed in the region through a regional solicitation process led by the TAB and its TAC. The Twin Cities region typically receives an estimated $43 million annually in STP-Urban funding (per 2010 data). A minimum local match of 20 percent is required for all STP-Urban funding. Currently, the solicitation categories do not include a category specifically for transit projects, but elements of a road project that benefit transit are eligible and typically given extra points to the project ranking.

Transportation Enhancements – Transportation Enhancements funding is used primarily for bicycle, pedestrian, and trail projects. In order to be eligible for funding, a project must meet the solicitation category requirements. Transportation Enhancements funding is distributed in the region through a regional solicitation process led by the TAB its TAC. The Twin Cities region typically receives an estimated $8 million annually in Transportation Enhancements funding (per 2010 data). A minimum local match of 20 percent is required for all Transportation Enhancements funding.

Federal Railroad Administration (FRA) – Federal Railroad Administration funding may be used on intercity passenger rail facilities. FRA funding is provided through congressional appropriations and varies in amount from year to year.

Unified Planning Work Program (UPWP) (5303) – Unified Planning Work Program funding may be used for transportation planning activities but may not be used on design, engineering, construction or capital related expenditures. As the regional Metropolitan Planning Organization (MPO) UPWP funding is allocated to the Metropolitan Council Metropolitan Transportation Services (MTS). MTS produces an annual work program specifying how the planning funds will be used with the majority of the funding used to support MTS planning staff work. The Twin Cities region typically receives an estimated $3.5 million annually in UPWP funding (per 2010 data). A minimum local match of 20 percent is required for all UPWP funding.

Special Grant Programs – There are many special grant programs that may provide funding for transitway projects, past programs include the Urban Partnership Agreement (UPA), the American Recovery and Reinvestment Act (ARRA), Transportation Investment Generating Economic Recovery (TIGER), and Transit Investments for Greenhouse Gas and Energy Reduction (TIGGER). The specifics of funding from these competitive programs - eligible/ineligible uses, estimated annual amount, local match – vary by specific grant type. The funding is allocated through Federal grant processes both FTA and Federal Highway Administration (FHWA), with some grants requiring submittal through the Metropolitan Council or Mn/DOT.

10.2.6.2. State Transit Funding

State General Fund – Funding from the state general fund is made available for transitway projects through appropriations by the state legislature and varies in amount from year to year. General funds are rarely used for capital investments and may include additional restrictions as specified in the appropriation language. General funds may be used for transitway operations and currently Hiawatha LRT receives an annual general fund appropriation of $5.2 million.

General Obligation (GO) Bonds – General obligation bonds can provide funding for transitway capital and are allocated through state legislative appropriations in varying amounts. Typically, the state has a large bonding bill in even numbered sessions and smaller or no bonding bill in the odd numbered sessions. The specific use of the funds is dictated by the appropriation language. Any capital expenditure funded by GO bonds must be for a specific capital project that will have a 20-year life and the asset must be owned by the public entity specified in the appropriation. GO bonds may not be used for planning studies, alternatives analysis, technology, vehicles, or operations expenditures. Minnesota Management and Budget (MMB) has directed that state GO bonds appropriated to the Council are not to be passed through to sub-recipients unless the bond appropriation language permits a pass-through.

Mn/DOT Trunk Highway Funds and Bonds – Mn/DOT trunk highway funds and bonds may be used on transitway projects that further a trunk highway purpose. Trunk highway funding can only be used for trunk highway purposes and cannot be used for transit operations. Capital assets that utilize trunk highway bonds must have a 20-year life, be owned by Mn/DOT and are considered part of the trunk highway system. Trunk highway funding and bonds are allocated through the state legislative process or a Mn/DOT grant program in varying amounts.

State Transit Funding Related Laws – Minn. Stat. 473.4051 subd. 3, prohibits state money from being used to pay more than 10 percent of the total capital cost of an LRT project.

In addition, Minn. Stat. 473.4051, subd. 2, states that “after operating and federal money have been used to pay for light rail transit operations, 50 percent of the remaining costs must be paid by the state”.

10.2.6.3. Metropolitan Council Funding

Motor Vehicle Sales Tax (MVST) – Minn. Stat. 297B.09 allocated 36 percent of the state Motor Vehicle Sales Tax funding to the metropolitan area transit fund to be used for transit assistance in the metropolitan area. The Metropolitan Council is responsible for allocating the MVST funds to various transit purposes. The funds are primarily used to pay for existing transit operations, both rail and bus. The funds may be used on transitway projects for existing operations or capital and operating expansion. MVST funding is allocated annually by the Council through the adopted Regional Transit Operating Revenue Allocation Procedure and Regional Transit Capital Revenue Allocation Procedure (adopted in September 2010).

Regional Transit Capital (RTC) Bonds – Regional transit capital funds are bond funds where the debt service is paid using the Council’s transit capital levy. The legislature is responsible for authorizing the amount of RTC bonds that may be sold and the Council is responsible for setting the annual levy to pay the debt. RTC funds are used for transit capital expenditures including assets with shorter than a 20-year life including transit vehicles and technology. RTC funds may not be used for transit operations or planning activities. RTC funds are allocated by the Council through annual development of the six-year CIP. There is typically $35 million in RTC funding available annually in the Twin Cities region.

Fares and Other Self-Generated Funds – Fares and other self-generated funds are typically used for transit operations. Fares from a transitway project are allocated specifically to the operations of that transitway. This allows for calculation of a net subsidy which represents the public cost after accounting for the fare revenue. The transit operator is responsible for allocating fare revenues through the budgeting process. Other self-generated revenue may include advertising revenue or interest income. These revenues are typically used for operating purposes but could be allocated to a capital expenditure.

10.2.6.4. Counties Transit Improvement Board (CTIB) Funding

Metro Counties Sales Tax – In April 2008 under authorizing legislation contained in Minn. Stat. 297A.99, five counties – Anoka, Dakota, Hennepin, Ramsey and Washington – formed a joint powers board known as the Counties Transit Improvement Board (CTIB) and implemented a quarter-cent sales tax and $20 a motor vehicle sales tax to fund transitway projects within these counties. The sales tax currently raises approximately $88 million annuals and under the legislation, may be used for transitway capital and operating costs. CTIB has adopted a Transitway Investment Framework, which establishes principles and rules regarding how the CTIB will invest in transitway development. Additionally, Metro Counties Sales Tax revenues cannot be used to fund more than 30 percent of the total transitway costs, though an individual component of the overall project may receive more than 30 percent if approved by CTIB. Currently, the Metro Counties Sales Tax raises an estimated $88 million annually and the funding is allocated through the CTIB grant application process. A minimum of a ten percent local (non-state) match is required for all CTIB funding.

10.2.6.5. Local

Regional Railroad Authority (RRA) – Minn. Stat. 398A.04 provides RRAs with the power to impose a property tax levy not to exceed 0.04835 percent of market value of all taxable property within the RRA boundary. Minn. Stat. 398A.07 states that a regional railroad authority may issue bonds as necessary to fulfill its purpose and to exercise any of its powers to provide funds for operating expenses in anticipation of revenues or for capital expenditures in anticipation of other funds.

Regional Railroad Authority funds may be available for transitway projects. Typically RRA funds are used for the AA phase of development, environmental processes, right of way acquisition, or for the local match in rail projects, with the exception of the Cedar Avenue BRT project in Dakota County. RRA funds must be no more than ten percent of the total capital project costs and cannot be used for rail operations in the counties that have enacted the Metro Counties Sales Tax (see Minn. Stat. 398A.10). The amount of funding available is tied to the levy limit and is allocated through the RRA budgeting process.

County General Fund – County general funds may be used on transitway projects as allocated. General funds are allocated through the county budget process and vary in amount from year to year.

County Highway Funds –County highway funds may be used for highway related transit improvements but may not be used for non-highway transitway purposes. Highway funds are allocated through the county budget process and vary from year to year.

City General Fund – City general funds may be used on transitway projects as allocated. General funds are allocated through the city budget process and vary in amount from year to year.

Municipal Highway Funds – Municipal highway funds may be used for highway related transit improvements but may not be used for non-highway transitway purposes. Highway funds are allocated through the city budget process and vary in amount from year to year.

Table 10-1 – Summary of Potential Transitway Funding Sources

Name (by source)	Estimated Annual Amount for Region	Min. Match	Eligible Uses	Ineligible Uses	Policy/Process for Allocating Funds
Federal					
New Starts (5309)	$ 95,000,000	20%	Approved new or extended fixed-guideway systems	Funding begins in PE, available only for approved projects	New Starts application/approval process
Small Starts (5309)	TBD	20%	New or extended systems that are fixed-guideway or bus corridor projects with specific components	Funding begins in PE, available only for approved projects	Small Starts application process
Bus Capital Improvements (5309)	Earmarks	20%	Bus capital and preventative maintenance	Rail capital	Annual Congressional requests/appropriations
Urbanized Area Formula (5307 & 5340)	$ 50,000,000	20%	Transit system replacement and expansion capital purposes, preventative maintenance, capital cost of contracting	Non-transit capital	Federal formula allocation to Council, allocated through Council CIP development
Fixed Guideway Modernization (5309)	$ 13,600,000	20%	Fixed-guideway projects (including BRT on exclusive or HOV lanes) capital and preventative maintenance	Non-fixed guideway projects	Federal formula allocation to Council, allocated through Council CIP development
Alternatives Analysis (AA) Funding (5339)	Earmarks	20%	AA activities (pre-LPA)	Spending complete by entry into PE	Annual Congressional requests/appropriations
Unified Planning Work Program (5303)	$ 1,300,000	20%	Planning activities	Construction/capital purposes	MTS annual work program planning
CMAQ	$ 25,000,000	20%	Transit capital and operating expansion (up to $7 million per project)	Existing transit operations/capital	TAC/TAB Regional Solicitation Process
STP (Urban Guarantee)	$ 43,000,000	20%	Primarily road constuction purposes (up to $7 million per project)	Must meet solicitation category requirements	TAC/TAC Regional Solicitation Process

Name (by source)	**Estimated Annual Amount** for Region	Min. Match	Eligible Uses	Ineligible Uses	Policy/Process for Allocating Funds
Transportation Enhancements	$ 8,000,000	20%	Primarily bicycle, pedestrian, and trail projects	Must meet solicitation category requirements	TAC/TAC Regional Solicitation Process
Federal Railroad Administration	Varies		Intercity passenger rail facilities		Congressional appropriations, special grant programs
Special grant programs (e.g. UPA, ARRA, TIGER, TIGGER)	Varies	Varies	Varies	Varies	Federal grant application process, some grant programs require submittal through Council or Mn/DOT
State					
General Funds	Varies	N/A	Specified in appropriation language	Rarely used for capital	State legislative process
General Obligation Bonds	Varies	N/A	Must meet public purpose requirement, use as specified in appropriation language. Capital must have a 20-year life, asset owned by organization specified in appropriation	Planning studies, AA, technology, vehicles, non-capital uses	State legislative process
Mn/DOT Trunk Highway Funds or Bonds	Varies	N/A	Must have a trunk highway purpose	Transit operations	State legislative process or Mn/DOT grant program
Metropolitan Council					
MVST (Regionally Allocated MVST)	Varies	N/A	Existing transit operations and expansion, capital is allowed	Non-transit purposes	Regional Revenue Allocation Policy/Procudures
Regional Transit Capital (RTC)	$ 35,000,000	N/A	Transit capital including vehicles	Transit operations	Council CIP development

Name (by source)	Estimated Annual Amount for Region	Min. Match	Eligible Uses	Ineligible Uses	Policy/Process for Allocating Funds
Fares/other self generated	Varies	N/A	Primarily service operations		Transit operator budget process
Counties Transit Improvement Board (CTIB)					
Metro counties sales tax	Raises about $88 M per year	10% non-state	Transitways capital and operating	General transit operations, arterial BRT	CTIB grant application process
Local					
Regional Railroad Authority (RRA)	Levy limit	N/A	Typically used for planning, AA, environmental, ROW, local match for rail projects with exception of Dakota County	Not more than 10% of capital costs. For metro counties with CTIB sales tax, cannot be used for rail operations	RRA budget process
County general fund	Varies	N/A			County budget process
County highway funds	Varies	N/A	highway related transit improvements	non-highway purpose	County budget process
City general fund	Varies	N/A			City budget process
Municipal highway funds	Varies	N/A	Highway related transit improvements	non-highway purpose	City budget process

10.3. EXISTING PRACTICE

This section of the technical memorandum presents information about the agencies that are currently involved in the planning, design, construction, and operation of transitways in the Twin Cities region, existing processes for project development, existing coordination activities, and existing transit operations.

10.3.1. Public Agencies Involved in Transitways

The provision of public transit in the Twin Cities region is complicated. Multiple modes are used to provide a variety of transit services by several public agencies and public and/or private transit operators. Multiple agencies are involved in the planning, design and construction of these facilities. As documented in section 10.2 above, there are many different statutes governing the provision of transit facilities and services in the region.

10.3.1.1. Federal Agencies

Several federal agencies may be involved in the funding of transitway development. The FTA is involved in the review and oversight of any projects that seek federal transit funding. This will likely include all light rail and commuter rail projects and may also include BRT projects. The FHWA may be involved in any project that includes highway improvements eligible for federal funding. This is most likely to occur with BRT projects but may also occur with other transit projects. The FRA is involved in the review of commuter rail projects. The lead agency is responsible for meeting all federal requirements when federal funding is used for a project. Metropolitan Council, acting as the MPO, provides project oversight on behalf of the FTA.

The recipient of federal funds, either Mn/DOT or the Metropolitan Council, is responsible for ensuring federal compliance. While a subrecipient is required to comply with all federal regulations, the recipient remains the entity responsible to the federal agency.

10.3.1.2. Minnesota Department of Transportation (Mn/DOT)

Mn/DOT is designated by state law as the lead agency for all aspects of planning, designing, constructing, operating, and maintaining Commuter Rail. In the case of Northstar Commuter Rail, Mn/DOT worked jointly with the Northstar Corridor Development Authority and Metropolitan Council to plan, design, and construct the line. Northstar service is operated by Metro Transit through an operating contract with BNSF Railway, which owns the underlying railroad. The vehicles and stations are owned and maintained by Metro Transit, which was selected through a competitive bidding process.

10.3.1.3. Metropolitan Council

The Metropolitan Council is the designated MPO for the Twin Cities metropolitan region. Federal law and regulation require that every metropolitan area over 50,000 in population have an MPO and a continuing, coordinated, and comprehensive transportation planning process in order to receive any federal transportation funds. Federal regulations require the participation of local elected officials in the planning process and this function is fulfilled by the TAB together with the Metropolitan Council. The Metropolitan Council must prepare a long-range transportation plan every four years, and performs long-range transit planning activities for the region.

The Metropolitan Council and TAB are responsible for the selection of projects for federal funding and the preparation of a four-year transportation improvement program (TIP), which is completed through the TAB. All federal funds used on a transitway project must be programmed in the TIP.

The Metropolitan Council, as the major regional transit operator, is the designated recipient of federal funds for transit projects (other agencies/entities may be subrecipients) and provides an oversight function when federal funds are used for a transitway project. The Metropolitan Council coordinates the operation of all public transit services in the region. The Council, through Metro Transit, a division of Metropolitan Council, operates Commuter Rail, LRT, and the largest bus system in the region. The Council also provides for some regular route and dial-a-ride transit services through competitive bidding processes.

10.3.1.4. Counties Transit Improvement Board (CTIB)

The Counties Transit Improvement Board (CTIB) is a joint powers board established in 2008 to grant funds to major transit infrastructure projects from proceeds of a one-quarter cent county sales tax levied within the seven-county metropolitan region (Minn. Stat. 297A.922 Subd. 4). Five counties (Anoka, Dakota, Hennepin, Ramsey, and Washington) currently levy the tax and are members of CTIB. CTIB has independent bonding authority, secured by future revenues of the transit tax. Funded projects must be consistent with the Transportation Policy Plan (TPP). CTIB's Transit Investment Framework provides policy guidance. CTIB prepares an Annual Financial Review and Capacity Estimate each year, which informs its annual grants process.

10.3.1.5. Regional Railroad Authorities (RRAs)

Minn. Stat. 398A.02 states the purpose of the Regional Railroad Authorities Act is to provide a means for one or more municipalities (including cities, counties, and towns) to provide for the preservation and improvement of local rail service and for the preservation of abandoned rail right-of-way for future transportation uses. The statue (Minn. Stat. 398A.04, subd. 2.) also states that regional railroad authorities may plan, establish, acquire, develop, construct, purchase, enlarge, extend, improve, maintain, equip, operate, regulate, and protect railroads and railroad facilities, including but not limited to terminal buildings, roadways, crossings, bridges, causeways, tunnels, equipment, and rolling stock.

An RRA may be organized by resolution or joint resolution by the governing body of one or more counties, or if the county chooses not to organize, by one or more municipalities, as a local governmental unit and a political subdivision of the state. Each of the seven counties in the metropolitan region has organized an RRA. RRAs play a significant role in the planning, design and implementation of LRT, Commuter Rail, and BRT in the region and have traditionally been the lead agency in planning activities during the alternatives analysis (AA), conceptual engineering, and initial National Environmental Protection Act (NEPA) processes.

Minn. Stat. 398A.04, subd. 2 states that RRAs may not expend state or federal funds to engage in planning for or development of Light-Rail Transit or Commuter Rail, unless this activity is consistent with a plan adopted by the Mn/DOT under Minn. Stat. 174.84 and a plan adopted by the Metropolitan Council under Minn. Stat. 473.399, and is carried out pursuant to a memorandum of understanding executed by the authority and the commissioner after appropriate consultation with the Metropolitan Council.

Minn. Stat. 398A.10 states that an RRA that has imposed the metropolitan transportation sales and use tax may not, by the end of a project, contribute more than ten percent of the capital costs of a LRT or Commuter Rail project. It also states that a regional railroad authority may not contribute any funds to pay operating and maintenance costs for LRT or Commuter Rail.

10.3.1.6. Metro Transit

Metro Transit, a division of the Metropolitan Council, is the largest transit operator in the region. Metro Transit operates all LRT and provides about 95 percent of bus rides in the region. Metro Transit also operates Commuter Rail through an operating contract with BNSF for the Northstar Line.

Metro Transit is also directly involved in planning and implementing transitway projects. Metro Transit has led LRT projects through the preliminary engineering (PE), final design, construction, and implementation phases, was the lead on operations planning elements for the Northstar Line, and is also the lead for the I-35W South BRT planning, construction, and implementation.

10.3.1.7. Suburban Transit Providers

There are six suburban transit providers in the region. These providers are local agencies that “opted out” of the regional transit taxing district in the 1980s and retained transit taxing revenues to provide their own transit services. The majority of services provided by these agencies are express bus services. Operation is typically contracted out to a private operator through a competitive bidding process with one suburban provider contracting its express service with Metro Transit. The suburban transit providers are:

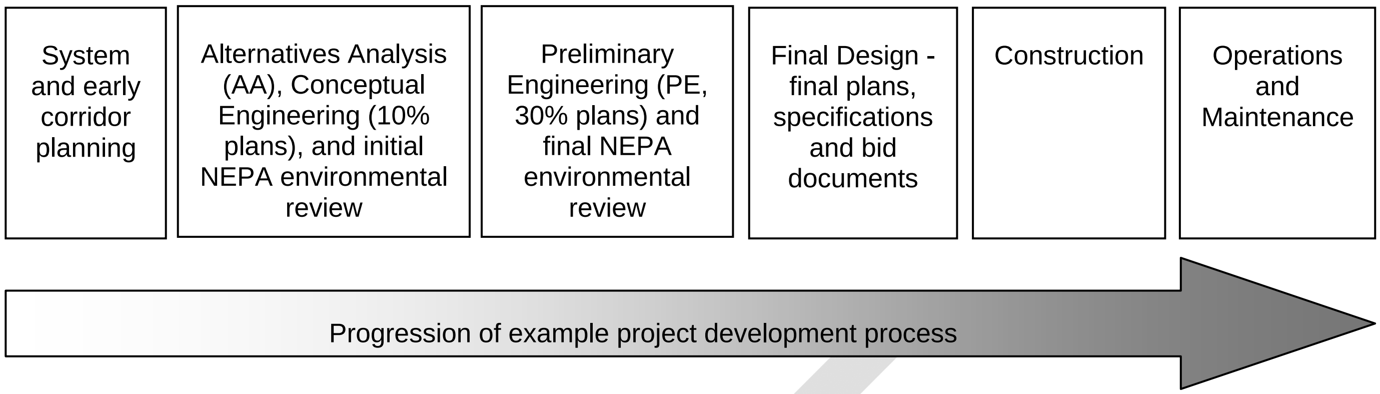
- Minnesota Valley Transit Authority (MVTA) serving the cities of Apple Valley, Burnsville, Eagan, Rosemount, and Savage
- SouthWest Transit (SWT) serving the cities of Chanhassen, Chaska, and Eden Prairie
- Maple Grove Transit (MGT) serving the city of Maple Grove
- Plymouth Metrolink serving the city of Plymouth
- Shakopee Transit serving the city of Shakopee
- Prior Lake Transit serving the city of Prior Lake

The City of Minnetonka also elected to opt out in 2002 but entered into an agreement with the Metropolitan Council for the Council and Metro Transit to continue to provide service for the city. Section 10.5 provides additional information on existing transit operations in the region.

10.3.2. Project Development Process

An example of a typical project development process is shown in Figure 10-1. However, every corridor is different, has a different mix of agency partners and stakeholders, and different funding sources have different project development process requirements. There are several variations on the project development process as a result. PE and final design may be combined into one design phase for Small Starts, Very Small Starts and non-New Starts projects. Some projects may be done with a simpler environmental review process than others and this might be done in the AA phase rather than the PE phase. Other project delivery methods, such as design-build, may have a somewhat different project development process. Ultimately, all projects have to address all of these steps in some manner.

Figure 10-1 – Example of Project Development Process



10.3.2.1. Federal New Starts Program

The Federal Transit Administration's (FTA) discretionary New Starts program is the federal government's primary financial resource for supporting major transitway investment projects. This program funds new, and extensions to existing, fixed-guideway transit projects including Commuter Rail, LRT, heavy rail, BRT, streetcars, and ferries.

New Starts projects must emerge from a regional, multi-modal transportation planning process and be documented in the region's Transportation Policy Plan (TPP). The New Starts program requires that a transitway project be completed in four major steps, each requiring FTA review and approval prior to receiving federal funding for the subsequent step. These four major project phases are:

Phase I – Alternatives Analysis (AA)

During the alternatives analysis (AA) phase, both mode and alignment options are evaluated for a particular corridor and compared on the basis of benefits, costs and impacts. This phase results in the selection of a locally preferred alternative (LPA), which is adopted by the MPO into the region's long-range transportation plan. In the Twin Cities, this phase is typically led by a RRA but could be led by Mn/DOT, the Metropolitan Council, a joint powers board, a county, or a city. This phase also typically involves up to ten percent conceptual engineering and initial activities for the environmental review process.

Phase II – Preliminary Engineering (PE)

During PE, design options are considered to refine the locally preferred alternative and complete the NEPA and Minnesota Environmental Policy Act (MEPA) process. A more detailed assessment of project costs, benefits and impacts of the LPA is performed based on 30 percent engineering. During this phase, local sponsors must also finalize management plans, demonstrate their technical capabilities to develop the project, and commit local funding sources. In the Twin Cities, this phase is legislatively required to be led by Mn/DOT or its designee for Commuter Rail projects, Mn/DOT or the Metropolitan Council for LRT projects, and by Mn/DOT, Metropolitan Council, a joint powers board, a county, or a city for BRT.

Phase III – Final Design

This phase includes the preparation of final construction plans, detailed specifications and bid documents. This phase culminates in the FTA's full funding grant agreement (FFGA) for construction of the project. In the Twin Cities, this phase is led by Mn/DOT or its designee for Commuter Rail; by

Mn/DOT or the Metropolitan Council for LRT; and by Mn/DOT, Metropolitan Council, a joint powers board, a county, or a city for BRT.

Phase IV – Construction

Bids are let and the project is constructed in this phase. In the Twin Cities, this phase is led by Mn/DOT or its designee for Commuter Rail; by Mn/DOT or the Metropolitan Council for LRT; and by Mn/DOT, Metropolitan Council, a joint powers board, a county, or a city for BRT.

10.3.2.2. Federal Small Starts Program

The FTA administers a project category called Small Starts, under the Section 5309 Capital Investment Grant program. These projects must have a total project cost of less than $250 million with a grant request of no more than $75 million. These projects must either be a fixed guideway for at least 50 percent of the project length in the peak period or must be a corridor-based bus project with substantial transit stations, signal priority, low floor/level boarding vehicles, special branding, frequent service (ten-minute peak/15-minute off-peak), and service at least 14 hours per day. FTA requires three phases for a Small Starts project:

Phase I – Alternatives Analysis (AA)

This can be a simpler process than that required for a New Starts project, but must still consider mode and alignment options in the corridor being studied. This phase results in an LPA. This phase also includes the required NEPA/MEPA process (may be a simpler process than an Environmental Impact Statement depending on the project). It would also typically include up to ten percent engineering for the LPA. In the Twin Cities, this phase would typically be led by an RRA or local unit of government, but could be led by Mn/DOT or Metropolitan Council.

Phase II – Project Development

This phase includes both preliminary and final engineering work. During this phase, the project sponsor must also develop a project management plan including a budget and schedule for implementation. This phase results in a Project Construction Grant Agreement (PCGA) with FTA. In the Twin Cities, this phase would be led by Mn/DOT or its designee for Commuter Rail, Mn/DOT or the Metropolitan Council for LRT, and by Mn/DOT, Metropolitan Council, a joint powers board, a county, or a city for BRT.

Phase III – Construction

Bids are let and the project is constructed in this phase. In the Twin Cities, this phase is led by Mn/DOT or its designee for Commuter Rail; by Mn/DOT or the Metropolitan Council for LRT; and by Mn/DOT, Metropolitan Council, a joint powers board, a county or a city for BRT.

10.3.2.3. Federal Very Small Starts Program

The FTA also administers a project category called Very Small Starts. These projects are simple, low-risk projects that qualify for a highly simplified project evaluation and rating process by FTA. The project must have a total project cost of less than $50 million and must have a capital cost of less than $3 million per mile (excluding vehicles). FTA requires a planning process for Very Small Starts projects that is similar to the Small Starts process described above. However, a Very Small Starts project may utilize a very simple AA process.

10.3.2.4. Non- New Starts/Small Starts/Very Small Starts Projects

There is no existing required process for non-New Starts projects. However, these projects (depending on their size and complexity) still need to go through some level of planning, design and construction process. It is typical for transitway projects to use a process similar to the New Starts or Small Starts/Very Small Starts process so that they can be eligible for federal funding at later stages in the project development process, if desired. These projects must also be consistent with the region's Transportation Policy Plan to use federal discretionary funds.

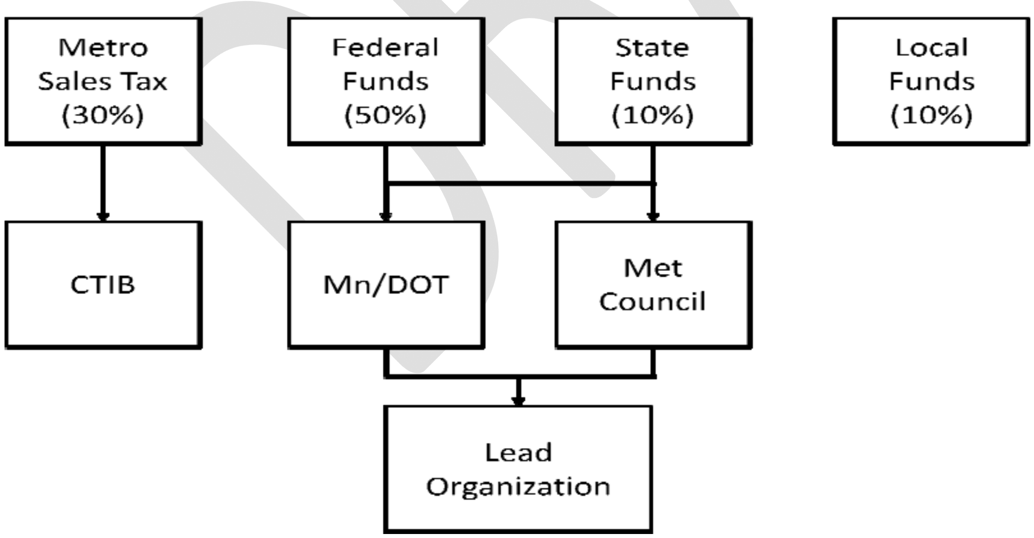
10.3.3. Funding Practices & Assumptions

10.3.3.1. Capital

Rail projects are assumed to be funded through the federal New Starts program. Eligible costs include preliminary engineering, final design, construction, rolling stock and project financing costs. Though these costs are eligible for federal participation, federal funding may not be received until a full funding grant agreement (FFGA) has been signed. Prior to the FFGA, federal funds may be received through specific congressional appropriations, which may or may not be in proportion to the expected 50 percent federal share. Therefore, the funding shares shown below are assumed to be reached at project completion, differing shares may occur throughout the various project stages. The final funding formula is:

- 50% federal
- 30% Counties Transit Improvement Board (CTIB)
- 10% State
- 10% County RRAs (distributed among the counties where the transitway is geographically located based upon percent of mileage within the county)

Figure 10-2 – Typical Flow of Transitway Funds



If a highway or arterial BRT were to receive New Starts funding, the assumed funding formula would be similar to that of rail transitways. Small Starts funding allows projects that have a capital cost of less than $250 M to receive up to $75 M in federal funding or 80 percent of the project costs, whichever is less. Highway and arterial BRT projects that are not New Starts or Small Starts do not have an "accepted" formula for the capital costs. There are a number of potential issues that arise related to the capital funding for BRT projects:

- Level of federal funding for the overall project is often unknown and maybe received from a number of different federal funding programs
- The project may be constructed incrementally over a period of many years and it becomes difficult to track and monitor the entire project costs and funding shares over long periods of time
- Oversight of the number of funding sources and eligibility of funding for individual project components can become very complicated.

10.3.3.2. Operating

The assumed funding formula for rail transitway operating costs is as follows:

- Calculate the net operating cost by subtracting fare revenue, advertising revenue, any allocated federal funding and any other revenue attributable to the rail facility from the total operating costs (total operating costs include Council allocations).
- For rail facilities completely within the metropolitan area, the net operating cost of the rail facility is to be paid:
    - 50% by CTIB using sales tax revenues, and
    - 50% by the state.
- For rail facilities that are partially within the metro area and partially outside the metro area, the net operating costs are to be paid:
    - 50% by CTIB and the other counties in which the transitway is geographically located based upon the percentage of transitway mileage within the CTIB or county boundary, and
    - 50% by the state.

In addition, current law, Minn. Stat. 473.4051, subd. 2, states that "after operating and federal money have been used to pay for light rail transit operations, 50 percent of the remaining costs must be paid by the state". However, "state" rail operating revenues have not been defined in law. To date, the state has not supplied 50 percent of the net operating costs for Hiawatha LRT or for Northstar Rail through general fund appropriations. The Council has used transit funds, primarily MVST, to provide the 50 percent state share. In addition, Mn/DOT using Greater Minnesota Transit funds pays 50 percent of the net operating costs for the state share of Northstar Rail that is outside of the 7-county area. Sherburne County pays the 50 percent local share of the operating costs for the portion of Northstar Rail that lies outside of the metropolitan area. It is assumed that in future budget years, the Council and Mn/DOT will continue to request the 50 percent state share of rail operating costs.

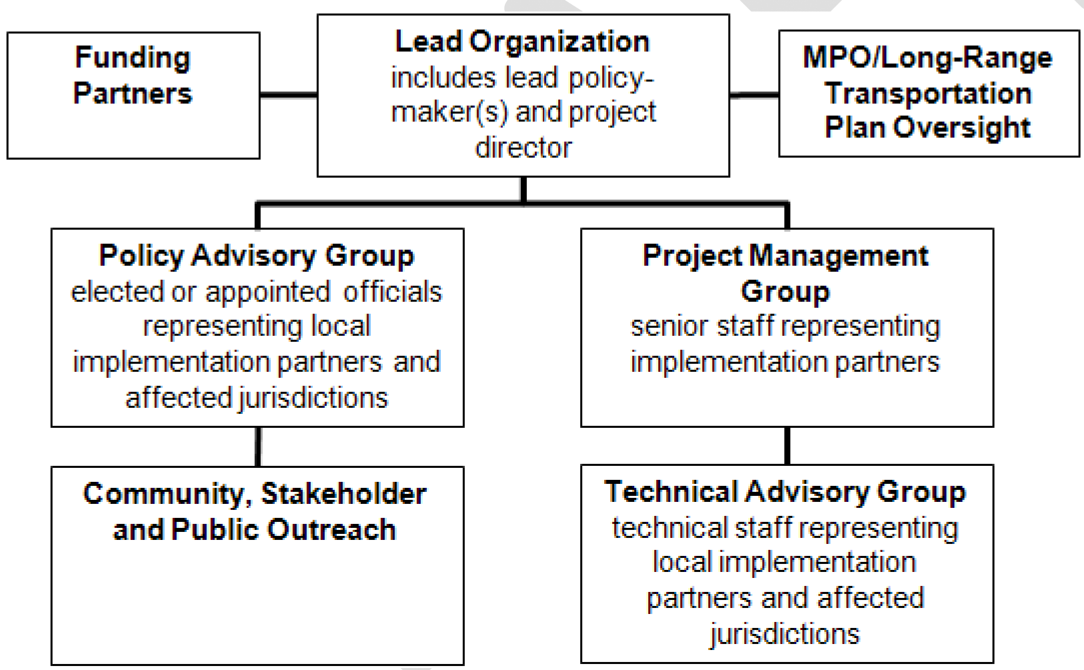
Highway and Arterial BRT do not have an agreed upon funding formula for the operating costs. To date, CTIB has agreed to fund 50 percent of the incremental operating costs for new service being implemented on both Cedar Ave BRT and I-35W South BRT. The remaining 50 percent has been paid by the Council using Regionally Allocated MVST funds. It is unclear whether this formula will be followed for all future service additions on BRT transitways.

10.4. EXISTING PROJECT LEADERSHIP AND OVERSIGHT ROLES AND RESPONSIBILITIES

The organizational structures used for several local projects during different phases of project development (Central LRT, Northstar Commuter Rail, Southwest LRT, and Cedar Avenue BRT) were reviewed to identify common functions, roles, and responsibilities along with strengths and weaknesses. Organizational charts for these projects are provided as Appendix E to this report. Based on a review of these projects, the following were identified as common functions that are required and/or beneficial for all projects. Projects in planning phases (e.g. alternatives analysis) will likely be more complex from a political perspective and may require much broader outreach to external partners and the general public, as well as a more collaborative decision-making process. Projects during construction will likely be more complex from a technical implementation and scheduling perspective and may require a more complex and expansive internal organizational structure. While the specific organizational structure may change with the phase of project development, the basic *functions* illustrated in Figure 10-3 are typically required for all projects. The *structure* for how these functions are carried out may vary depending on the phase of project development and the complexity of the project.

The leadership and oversight bodies identified in Figure 10-3 each play a role in fulfilling these responsibilities, as described in the following paragraphs.

Figure 10-3 – Typical Project Leadership and Oversight Functions



10.4.1. Funding Partners

The funding partners provide funding to plan, design, construct, operate, maintain, and expand the transitway project. Funding partners may change when a project moves from one phase of project development to another. The funding partners advise the lead agency on project decisions with substantial or potentially controversial financial implications. The funding partners have decision-making authority related to the use of funds they contribute to the project and provide advice to the lead agency on policy issues. Coordination with funding partners may be accomplished through a formal committee (e.g. a financial advisory committee), through interagency agreements, or through other agreed-upon informal or formal processes.

10.4.2. Metropolitan Planning Organization (MPO)

The MPO is a federally required organization that is responsible for working with its local partners to develop and maintain transportation plans for the metropolitan area, including a long range transportation plan. The MPO in the Twin Cities region is the Metropolitan Council and its TAB, and the long range transportation plan is the TPP. Any transitway project that receives federal, state, or CTIB funding must be consistent with the region's Transportation Policy Plan.

10.4.3. Lead Agency

Once a project has entered preliminary engineering, the lead agency may be referred to as the project sponsor, consistent with FTA terminology. The lead agency for a Commuter Rail project is the Commissioner of Transportation (Mn/DOT) per MN Statue 174.82, but the statue allows the Commissioner to delegate the authority to a public or private entity including a regional railroad authority, a joint powers board, a railroad or the Metropolitan Council per MN statue 473.4057; this leadership designation is assumed to apply after a locally preferred alternative has been selected for a corridor and adopted into the region's long-range transportation plan. For LRT, pursuant to Minn. Stat. 473.3994, subd.1a, the Governor designates either Metropolitan Council or Mn/DOT as the responsible entity; this leadership designation is assumed to apply after a locally preferred alternative has been selected for a corridor and adopted into the TPP. Through the selection of a locally preferred alternative (LPA), the lead agency may be an RRA (if rail is still an alternative being considered), county board, joint powers board (including transit providers), city, Mn/DOT, or the Metropolitan Council. However, specific legislation does not exist for lead agency candidates prior to the selection of an LPA and the lead agency may change when a project moves from one phase of project development to another.

Primary responsibilities of the lead agency include providing overall project leadership by identifying and managing project funding, schedule, the delivery of all project tasks, and the delivery of all project leadership, oversight, coordination, and outreach. The lead agency includes one or more lead policy-maker(s) and identifies a project director who is responsible for project management, including coordination (with Mn/DOT and/or Metropolitan Council involvement) with the FTA, as well as the FRA and FHWA, if required.

The lead agency may establish interagency agreements to allow for the execution of project tasks by other project partners including, but not limited to, the provision of funding, corridor planning, design, construction, right-of-way acquisition, and utility relocation. The lead agency may establish a project office and assemble additional staff (including staff from various implementation agencies) dedicated to the project. The lead agency may also establish advisory committees (including the legislatively required corridor coordinating committee for Commuter Rail and corridor management committee for LRT) depending on the phase of development, geographic size, and complexity of a project. Examples of advisory committees include financial, community, business, land use, communications, risk management, and advocacy.

The lead agency is responsible for ensuring that ALL tasks are accomplished that are needed to implement the project and achieve full funding and all necessary project approvals. The specific responsibilities of the lead agency will vary depending on the phase of project development and the complexity of the project. The lead agency may choose to ask an implementing partner to execute some of the activities, but such relationships should be reflected in an appropriate interagency agreement (also cooperative and funding agreements, if needed). Typical responsibilities of the lead agency will include:

- Intergovernmental and public relations, including policy-making, land use coordination/transit oriented development, public information, community outreach, and interagency coordination and agreements.
- Administration and project controls, including information resources, document management, schedule management, project/change control, reporting requirements, financial oversight, grant requirements, contract administration, procurement agreements, interagency agreements, legal requirements, and risk management.
- Securing funding for each phase of project development, including grant applications, grant management, financial oversight, and reporting requirements.
- Environmental requirements, including NEPA process, environmental permits and approvals, Phase I and II (contaminated sites) investigations, Section 106 (historic/cultural resources)/State Historic Preservation Office (SHPO) requirements and agreements, and environmental mitigation and monitoring during and after construction.
- Right-of-way activities, including acquisition, easements, appraisals, agreements, property management, and mapping.
- Design and engineering activities, including civil, transit (runningway), systems, traffic, bridge, station design, vehicle maintenance facilities, streetscape design, and design coordination with other jurisdictions.
- Construction, including civil, bridge, transit (runningway), systems, streetscape, maintenance of traffic, utility relocations, stations, vehicle maintenance facilities, inspections, work zone safety, emergency response, and coordination with other jurisdictions.
- Procurement, including vehicles, fare collection systems, and other necessary materials and equipment. In the case of LRT and Commuter Rail, these responsibilities also include start-up planning and testing.
- Lead agency responsibilities do *not* include transit operations unless the lead agency is the Metropolitan Council or the designated transit operator as designated by legislation.
- While the lead agency is not directly responsible for service planning, the lead agency should coordinate with Metropolitan Council and affected suburban transit providers to ensure that the necessary transit service planning is completed. As a principal funder of transitway operations, the Metropolitan Council/Metro Transit is responsible for service planning on transitways. The Council may delegate this responsibility to a local transit provider but must approve the service plan. Transit service planning must be done in cooperation with the local transit provider(s) when the transitway impacts a suburban transit provider's jurisdiction.
- Assembly of project funding is the responsibility of the lead agency working in partnership with the other funding partners and stakeholders.

10.4.4. Policy Advisory Group/Corridor Coordinating Committee/Corridor Management Committee

The policy advisory group (which may take the form of a policy advisory committee in the AA/concept design and initial NEPA phases; the corridor coordinating committee for Commuter Rail projects in subsequent phases per Minn. Stat. 174.86, subd.5; or the corridor management committee for LRT projects in subsequent phases per Minn. Stat. 473.3994, subd.10) includes elected or appointed officials representing each city and county through which the corridor passes, local funding and implementation partners, and others consistent with the direction set in the statutes. The policy advisory group advises the lead agency on issues with substantial or potentially controversial policy or financial implications, and provides a liaison with the elected/appointed bodies of the member organizations. The policy advisory group should operate separately from any advocacy committee or organization. Typically, the chair of the policy advisory group is the lead policy maker from the lead organization.

10.4.5. Project Management Group

The project management group consists of the project director and corresponding director-level staff having technical backgrounds from local implementation partners, or their designees. The project management group advises the project director and lead agency on issues with substantial or controversial technical, policy, or financial implications. During some phases of project development or on less controversial projects, the functions of the project management group and the technical advisory group may be combined.

10.4.6. Technical Advisory Group

The technical advisory group is made up of technical staff representing each city and county through which the corridor passes, local implementation partners, and others as appropriate to the specific transitway project. The technical advisory group advises the policy advisory group, the project management group and the lead agency on technical issues and elevates issues with policy or financial implications. Coordination with the technical advisory group may be done through a formal committee (for example, a technical advisory committee), or through other agreed-upon informal or formal processes. Typically, the chair of a technical advisory group is from the lead organization. During some phases of project development or less controversial projects, the functions of the project management group and the technical advisory group may be combined.

10.4.7. Affected Communities, Stakeholders and General Public

Coordination and consultation with the affected communities, stakeholders, and the general public may or may not be done via formal committee(s), but outreach to affected communities, key stakeholders, and the general public is always needed. Affected communities, stakeholders, and the general public advise the lead agency, policy advisory group, project management group, and technical advisory group on issues of concern, including issues with technical, policy, or financial implications. Key stakeholders include natural resource and permitting agencies, the Metropolitan Council's Transportation Accessibility Advisory Committee (TAAC) and other advisory groups, local communities, advocacy groups, neighborhood and business associations, and many others.

10.5. EXISTING TRANSIT OPERATIONS

10.5.1. Commuter Rail

BNSF is the contracted operator for the Northstar Commuter Rail. When the right to operate on the BNSF mainline was purchased, BNSF required that they be the operator for the first ten years. Due to the specifics of federal law regarding railroading, most Commuter Rail properties contract out the operations of service, either to the railroad, a private contractor or Amtrak. Metro Transit is responsible for operations, including service planning, and was selected to maintain the Commuter Rail vehicles and facilities using a competitive bidding procurement process.

10.5.2. Light-Rail Transit

LRT in the Twin Cities is managed, operated, and maintained by Metro Transit. The operation for the existing Hiawatha LRT was originally bid competitively. Legislation (Minn. Stat. Section 473.4051) now requires that all LRT in the seven-county metropolitan area be operated by Metropolitan Council/Metro Transit.

10.5.3. Bus Service

Bus service in the Twin Cities metropolitan region is provided by several entities including Metro Transit, several suburban transit providers, and a number of private contractors under contract with the Metropolitan Council and others (e.g. City of Ramsey, University of Minnesota).

10.5.3.1. Metro Transit

The Metro Transit division of Metropolitan Council operates the largest public transit system in the state, having provided about 78 million bus and rail rides in 2010. Metropolitan Council is the regional transit service provider except in those communities that have chosen to "opt-out" of the regional system (see Suburban Transit Providers section below).

10.5.3.2. Metropolitan Transportation Services

The Metropolitan Transportation Services (MTS) division of Metropolitan Council provides some transit service under contract mostly through competitive procurements. Contracted regular-route services consist primarily of commuter routes from suburbs into the central cities and suburban local routes. These services are provided by private companies under contract with the Council. In 2009, these routes carried 2.4 million passengers. MTS also provides supplemental transit service for the entire seven-county metro area, mostly through competitive contracts. These services are Metro Mobility, the Americans with Disabilities Act (ADA) service provided when/where all-day regular route transit service is offered, and Transit Link, the dial-a-ride service provided throughout the metro area where regular route transit service is not offered. MTS also contracts for subsidized commuter vanpool services.

10.5.3.3. Suburban Transit Providers

In 1981, the Legislature authorized a Metropolitan Transit Demonstration Program (Minn. Stat. 174.265) that allowed any city or town or group of cities and/or towns to test providing public transit service for communities that were not adequately served by the regional transit service existing at that time. The Legislature subsequently statutorily authorized a permanent Replacement Service Program (Minn. Stat. 473.388) continuing the demonstration program. Cities had to exercise their option to "opt-out" by the sunset date of July 1989. Twelve cities "opted out" of the regional system. These communities were allowed to retain up to 90 percent of the transit property tax levied in their communities to provide transit services themselves. Some formed joint powers agreements. There are currently six Suburban Transit Providers, which carried nearly 4.8 million riders in 2009, including:

- Minnesota Valley Transit Authority (MVTA) serving the cities of Apple Valley, Burnsville, Eagan, Rosemount, and Savage
- South West Transit (SWT) serving the cities of Chanhassen, Chaska, and Eden Prairie
- Maple Grove Transit (MGT) serving the city of Maple Grove
- Plymouth Metrolink serving the city of Plymouth

- Shakopee Transit serving the city of Shakopee
- Prior Lake Transit serving the city of Prior Lake

In 2002, as a result of a short-term opportunity provided to the cities of Minnetonka and Shorewood by the 2000 Legislature, the City of Minnetonka elected to opt-out. The city entered into an agreement with the Metropolitan Council to continue to provide service for the city because the city determined that was a more economically advantageous approach than providing the service itself. The city evaluates transit services annually.

Today, the suburban transit providers provide primarily commuter express service to downtown Minneapolis, downtown St. Paul and the University of Minnesota. All use private contractors (selected through a competitive procurement process) with the exception of Maple Grove, which contracts its express service with Metro Transit. Southwest Transit performs some aspects of the service directly (e.g., maintenance). In 2008, the suburban transit providers (excluding Minnetonka) provided 5.8 percent of the region's *total* rides but delivered 33.5 percent of the region's *express* rides.

10.5.4. Existing Metropolitan Council Contracting Process

The Metropolitan Council both directly operates transit service through Metro Transit and contracts for service. The Metropolitan Council makes the determination of whether to competitively bid services based on the amount of service to be procured, and the anticipated benefits and costs of a competitive procurement. When the Metropolitan Council determines that it is appropriate to bid out a route(s), a competitive bidding process is used to select the service operator. The suburban transit providers (within their respective jurisdictions) and/or private operators may compete for these services. In some cases, Metro Transit will also provide a cost proposal to be used to determine whether the service should be directly operated.

The following process is a typical process used for this competitive bidding process:

- A written request for proposal (RFP) is issued that documents all proposal/bid requirements including details of the services to be provided and the regional performance standards that must be met while providing the services. Council-owned buses are usually provided for the service.
- A pre-proposal conference is held and written responses to written questions are provided to the proposers.
- Written proposals and bids are submitted by the proposers.
- Proposals are reviewed by an evaluation panel composed of people who are not employed by any of the proposers. Proposals are reviewed based on evaluation criteria published in the RFP.
- Interviews may be conducted.
- If negotiations are required, they are conducted by a negotiation team that is separate from the evaluation panel.
- The recommendations of the evaluation panel are reviewed by the Council Transportation Committee.
- The Metropolitan Council makes the final selection based on recommendations of the evaluation panel and findings, conclusions and comments of the Transportation Committee.
- A contract is negotiated with the selected operator.

The RFP includes a definition of organizational conflicts and the process to be used for protests. In those cases where Metro Transit has also provided a cost proposal for the services to be provided, “walls” are established to avoid any organizational conflict of interest. The Metro Transit cost proposal is reviewed against those submitted by other providers to determine whether there is a cost advantage in directly operating the service.

Typically, the evaluation criteria will include past experience and size of services provided in relation to the services required in the RFP: driver training and selection program, management, administration, financial and technical capabilities, vehicle maintenance practices, reporting capabilities, compliance with the RFP, and cost. Cost is approximately equal in importance to the combination of the other evaluation criteria.

10.6. TRANSIT TRAVEL DEMAND FORECASTING[1]

Travel demand modeling is an essential part of transportation planning for transitway investments. It allows project planners to identify and analyze travel demand markets and produces ridership estimates. Estimates of ridership are important throughout the transitway development process for project justification; in early planning stages for alternative analysis and selection; and in later planning stages for service planning, facility needs assessment, and future revenue projections. Realistic and defensible travel demand forecasts are needed at every stage of transitway planning and project development.

10.6.1. Lead Agencies and Responsibilities

The Metropolitan Council, acting in its role as the federally recognized MPO, is responsible for ensuring high quality, consistent and defensible travel demand forecasting is completed for all transportation projects in the Twin Cities region, including transitway projects. However, the Metropolitan Council itself does not typically perform the travel demand forecasting work, and it may or may not be the organization leading the development effort for a particular transportation project (lead organization). For these reasons, local partner agencies and the consulting community also bear responsibility in developing the region’s travel demand forecasts.

For every project, the Metropolitan Council is responsible for maintenance and development of the Regional Travel Demand Forecast Model (Regional Model) and for the development of forecast socio-economic data. In cases where the Metropolitan Council is a project’s lead organization, it is also responsible for directing travel demand forecasting and other work being performed by one or more consulting firms.

In cases where a local partner is the lead organization, the local partner is responsible for directing work being performed by one or more consulting firms and also for involving Metropolitan Council forecasting staff in a cooperative review during all phases of travel demand forecasting. At a minimum, this cooperative review should take place during the following phases of a study:

- Development of a proposed scope of work
- Review of proposed travel demand forecasting methodology prior to beginning any modeling work
- Review of model validation prior to proceeding with forecasts

1 The travel forecasting section was prepared by Metropolitan Council forecasting staff Mark Filipi and Jonathan Ehrlich with assistance from Steve Wilson, SRF Consulting Group, Inc., and Steve Ruegg, Parsons Brinckerhoff.

- Review of no-build or baseline input assumptions
- Review of draft forecasts prior to their presentation to project stakeholders, including policy makers and the general public.

10.6.2. Forecasting Goals and Allocation of Effort

Travel demand forecasting should be used judiciously and may serve different purposes throughout the project development process. The goal of travel demand forecasting is to develop results that are logical, sensible, and reflective of key differences between alternatives; a perfect number will not be produced by travel demand forecasting. The development of these kinds of high quality, defensible forecasts takes time and effort.

Independent of the phase of project development, national and local experience suggests that a third to half of an overall forecasting effort is typically devoted to building and validating the base model before running or analyzing any alternatives. Furthermore, these experiences suggest that travel demand forecasting makes up a quarter to half of a particular study's overall effort. This will vary depending on the length of the corridor and the overall complexity of the project. Lead organizations and consultants should be mindful of these guidelines when scoping forecasting tasks for a study.

During feasibility studies and early phases of alternatives analyses, travel demand forecasting should be used to identify and describe the travel markets present in a potential transitway corridor and to produce high-level transit ridership demand data for proposed alternatives. A screening evaluation should be performed based on factors other than travel demand to limit the number of alternatives requiring travel demand forecast modeling. In addition, similar alternatives should be grouped to minimized potential distractions caused by operational variations that are not yet significant during this phase of project development. These approaches will allow the forecasting team to keep the development of a solid base model and identification of travel demand markets as top priorities.

In later stages of project development, the purpose of travel demand forecasting is to produce results that are unbiased across the alternatives under consideration. At this point in the process, all of the ridership markets on each alternative under consideration should be understood and correctly modeled. Modeling process and coding should be consistent across alternatives.

10.6.3. Travel Demand Forecasting Model Options

Several potential travel demand forecasting approaches might apply to transit projects in the Twin Cities, depending on a project's stage of development or scale. In general, these approaches fall into two categories: the Regional Model or rule-based market analysis tools.

The Regional Model is a multi-modal transportation forecasting model maintained in the Twin Cities region by the Metropolitan Council. Its results are based on use of socio-economic data allocated throughout the region to traffic analysis zones (TAZs) and a classic, four-step travel demand modeling process. The modeling process generates trips for each TAZ based on forecasted demographic and economic variables. The modes of travel available in the zone, also called generalized accessibility, are used to calculate trip destination by purpose. Generalized cost (including travel time) is used to calculate the mode of each trip. Transit trips are then assigned on the regional network. The Regional Model is a series of sub-models, which reflects complex interactions between travel time, accessibility, and cost across different trip purposes and market segmentations (e.g. income, auto ownership).

Rule-based market analysis tools are based on allocation of portions of existing markets based on base market data (e.g. Census Transportation Planning Package (CTTP) or Longitudinal Employer-

Household Dynamics (LEHD) data for the work market) and selected characteristics of the transit system. Several examples of rule-based market analysis tools in use today are include:

- Aggregate Rail Ridership Forecasting (ARRF) II Model: A rule-based model which applies a series of expected rail shares and adjustments for service characteristics to 2000 CTTP Data. It was developed by FTA to estimate rail ridership for cities without existing rail systems, and is used as a secondary check for New Starts forecasts.
- Metropolitan Council Park-and-Ride Demand Model: The Metropolitan Council currently uses a rule-based model for forecasting park-and-ride demand. A series of factors (downtown workers, mode splits, etc.) developed from LEHD and surveyed parking origin data are applied to forecast population to develop future demand.
- Transit Boardings Estimation and Simulation (TBEST) Tool: The state of Florida has developed a comprehensive transit analysis and ridership forecasting model that is capable of simulating travel demand at the individual stop level while accounting for network connectivity, spatial and temporal accessibility, time-of-day variations, and route/stop competition and complementary effects.

Model selection is discussed in the next section. Selection of any given model approach should be made with an awareness of its strengths and limitations, as well as an understanding of the inherent uncertainty involved with any modeling effort.

10.6.4. Forecasting Process

This section of the document focuses on several key elements of the forecasting process; the goal of each forecast refinement, the selection of a model and refinement of methodology, validation of the base model, and documentation of base and future year results. This discussion is not intended to be a technical manual of forecasting practice, but to summarize key issues underlying the needed scope and complexity of the forecasting process.

10.6.4.1. Iterative Nature

Forecasts evolve over time, along with the rest of the project during the development process, as new data becomes available. Model inputs to be refined at each step include both networks and zonal data (though the socio-economic data used for forecasts needs to be the approved Metropolitan Council TAZ data for base forecasts). However, each step should use the same model (overall process, set of programs, linkage to survey data, etc.). At each refinement, ridership forecast numbers may increase or decrease. The goal of each refinement is to produce the highest quality forecasts based on known alignment data and the latest planning assumptions. It should not be to match or exceed the result of previous forecasting effort.

10.6.4.2. Model Selection

A primary consideration in selecting the travel demand forecasting approach is the type of funding for which the lead organization wants the project to be eligible. The largest sources of federal funding for transit capital projects are the New Starts, Small Starts, and Very Small Starts programs. Forecasting for projects that may become New Starts projects should use the Regional Model and be done in cooperation with Metropolitan Council forecasting staff as noted above.

While other and simpler methods of forecasting ridership exist for Small Starts, Very Small Starts, and non-New Starts projects, use of the Regional Model is recommended as a starting point for all projects. The Regional Model is the only forecasting methodology available with:

- The ability to reflect all geographic markets, including non-work markets, for a corridor
- Sensitivity to various scenarios of future development
- Sensitivity to routing, access, and operating characteristics of the transit and other transportation systems
- The ability to extend analysis beyond basic total ridership, including analyzing ridership by station/stop and to follow a trip from origin to destination, and the ability to measure trip-based user benefits.

Another benefit resulting from use of the Regional Model on all transit projects is its consistent use creates opportunity for comparison of travel demand results among different corridors in the region.

Use of the Regional Model for Small Starts, Very Small Starts, and non-New Starts projects may be more flexible in methodology than its use for New Starts projects. In particular, New Starts forecasting conditions required to ensure national comparability – such development of a baseline alternative and the requirement for a constant trip table – are not required for projects being developed and delivered outside the New Starts/Small Starts process. However, a lead organization should be aware of and acknowledge the financial and political risks created using these approaches should the project evolve into a New Starts project. Another opportunity for these kinds of projects is that when only near-term forecasts are required, it may be acceptable to use trip tables derived from transit surveys rather than the full modeling process.

There are cases where the Regional Model may not be the best analysis tool and rule-based market analyses should be performed and documented. But when using rule-based models, it should be recognized that few are accepted by FTA for use in New or Small Starts projects, and those that are tend to be are as data-intensive and complex as four-step and activity-based regional forecast models. Examples of projects where a rule-based market analysis may be appropriate are:

- Park-and-ride facility planning - the Council's Park and Ride Demand Model may be a more appropriate tool
- Local route planning applications where stop spacing is smaller than the TAZ size in the Regional Model
- Projects where service changes are not anticipated to generate new ridership and benefits are intended to be estimated for existing users only

10.6.4.3. Development of Model Assumptions and Modifications

Input data used for forecasting should be based on latest planning assumptions. Land use and socio-economic forecasts for the horizon year should be based on approved Metropolitan Council municipal totals and consistent with local comprehensive plans. Highway and transit networks should be consistent with the adopted TPP. Potential changes in approved socio-economic data or TPP amendments should be discussed with Metropolitan Council staff. Service planning assumptions should be reviewed by appropriate transit agencies and Metropolitan Council staff.

It is often worthwhile, especially when there is significant uncertainty in long-range socio-economic forecasts or local transportation improvements, to perform sensitivity analysis on key inputs. This increases the number of model runs required, but can provide insights to the reasons for resulting ridership forecasts and their reasonableness.

For corridor-level analysis, expansion of the model zone system and/or sub-area zone splits are often warranted. Application of these and other modifications to the Regional Model structure or parameters should be done with care and with consultation with Council staff.

10.6.4.4. Model Validation

Forecasting results produced using the Regional Model and rule-based market analyses both require validation against observed data as model results are only meaningful in the context of observed data. The Regional Model is calibrated and validated at a regional system level. Before it can be used to produce valid and credible corridor transit forecasts, the model's reasonableness in the base year needs to be reviewed and documented in the corridor study area. This is to check for problems with the model itself, which would not be visible on a regional scale, and to check for coding errors in input files. The agency and the person or firm performing the validation should review and analyze data and results prior to submitting them to the Metropolitan Council for review. Specifically, counter-intuitive results should be explained in writing. This analysis should be documented and submitted along with the data and results.

Validation should include, but is not limited to, comparison of the modeled and observed:

- Highway and transit travel times and speeds
- Productions and attractions, and person trip tables by district and by trip purpose
- Assignment of transit trip tables from survey data compared to observed boarding data
- Base year transit assignment results by:
  - Time of day
  - Line for routes within the corridor
  - Mode of access by route and/or station
  - Type of service (express, local, LRT, BRT, etc.)

Content of validation for non-Regional Model methods may differ from that described above, although a linkage to observed data remains critical. Validation should be performed in consultation with Metropolitan Council forecasting staff.

10.6.4.5. Forecast Development

While validation of the model in the base year is a necessary step toward ensuring that the model is reasonably reflecting future conditions, it is not a guarantee. The complexity of the modeling process (and, indeed, the future itself) can make the determination of forecast reasonableness and the cause of any errors difficult. A systematic approach to developing the base future year (no build or baseline) and alternative model runs is recommended.

Differences between forecasts from one step in the process and the next, or between build alternatives, should be traceable to changes in input assumptions and be sensible. A stepped series of forecasts building up from the base year to the full future forecast is a systematic approach that is often useful to understand the dynamics of the input assumptions and their impact on the final forecast. The steps in a stepped approach could be as illustrated in Figure 10-4:

Figure 10-4 – Build-up Forecast

	Step 1- (Validation Run)	Step 2	Step 3	Step 4	Step 5 (No-Build)	Step 6 (New Starts Baseline)	Step 7 (Build)
Base Year Forecast							
Future Year Development							
Future Year Parking Costs							
Future Year Highway Congestion							
Future Year Transit System (no transitway improvement)							
Other Corridor Improvements							
Transitway Improvement							

While this approach moderately increases the number of forecast model runs required, it is a worthwhile investment of time and resources that will ensure all transitway projects in the Twin Cities are developed based on credible and defensible travel demand forecasts. The first forecast and the last three forecasts are typically produced in any normal study process.

10.6.4.6. Forecast Documentation

Forecast methodology (including zonal data changes and transitway operating parameters), validation and results should be fully documented. Draft documentation of methodology and validation should be submitted to Metropolitan Council forecasting staff before any official model runs are performed. This submittal should include electronic copies of the transit networks (validated base and build networks).

During transit forecast development, the following should be analyzed, documented in writing, and provided to Metropolitan Council forecasting staff:

- Changes to base zonal data or networks (both highway and transit)
- Specified vs. calculated headways and travel times
- Modeled person trips by purpose, by district, by time of day, and by mode
- Modeled district-to-district transit trips
- Modeled boardings in the corridor by mode, by time of day, by route or group of routes
- Modeled transfers
- Modeled screen-line volumes

- Modeled passenger loads by route, mode, and time-of-day and peak loads
- Forecast ridership by access and egress modes by route and by station
- Passenger and vehicle hours/miles of service

The agency and the person or firm producing the forecasts should review and analyze data and results prior to submitting them to the Metropolitan Council for review. Specifically, counter-intuitive results should be explained in writing. This analysis should be documented and submitted along with the data and results. When forecasting is complete, electronic copies of the model developed and all data should be sent to the Metropolitan Council for preservation.

10.6.5. Presentation of Results

All travel demand forecasts are derived from models of future conditions based on uncertain assumptions and limited base data. All forecasts contain risk and uncertainty. It is often appropriate to clearly communicate this uncertainty when presenting results. If the forecast involves multiple alternatives, communication of uncertainty may help in evaluating the significance of differences in results between alternatives.

No performance measure, including ridership, can be fully evaluated without the presence of a no-build alternative for comparison. The no-build alternative should be forecasted using the same validated model or alternate methodology as the comparison alternative (for FTA New Starts projects, comparison to the New Starts Baseline is also required).

10.6.5.1. Transitway Ridership Definition

It is useful when comparing different potential transitways in the region to have a set of metrics with consistent definitions. In particular, *ridership* can be a difficult metric to apply in different settings, given the potential complexity of connecting, parallel, and feeder service and the differing route structures of LRT, Commuter Rail, and BRT service.

For the purposes of regional comparison, ridership should be defined as:

LRT:	Rides taken using the LRT service
Commuter Rail:	Rides taken using the Commuter Rail service
BRT:	Rides taken using the BRT station-to-station services
	Rides taken on local or express services that utilize a defined transitway runningway for at least 50 percent of the route and use at least one non-downtown transitway station

Care should be taken to count (one-way) rides, to avoid double-counting transfers, and to exclude any rides provided on transitway feeder services that do not travel on the transitway from the transitway ridership total. Express bus ridership that does not primarily travel on the transitway runningway or does not serve at least one non-downtown station on the transitway should not be counted. Ridership on bus routes that are primarily feeder service or on parallel routes that do not use the transitway runningway should not be counted. Rides on local service using an Arterial BRT runningway should be counted.

10.6.5.2. Other Performance Measures

No single performance measure can fully represent the benefits of transitway service or serve as a basis for comparison between corridors or alternatives in all cases. Differing performance measures may be warranted for different types of projects (a new transitway vs. a new station). Other potential measures that should be evaluated are new transit riders, existing riders that benefit from a transitway, total corridor riders, passenger miles per mile, total linked and unlinked trips, transit travel time saved and total user benefits.

10.7. CAPITAL INVESTMENT CRITERIA

The FTA has implemented a rigorous evaluation process for major transit investment projects that are federally funded through the New Starts or Small Starts programs. Previously planned Commuter Rail and LRT projects in this region have followed these processes. However, current BRT projects have not utilized New Starts/Small Starts funding and, thus, have not been required to follow the federal guidelines. There are no current regional guidelines establishing capital investment criteria for projects which are non-New Starts funded projects. CTIB has adopted a Transit Investment Framework which includes criteria that guide its investment priorities and decisions.

10.7.1. New Starts Evaluation Criteria

New Starts projects must undergo evaluation by the FTA throughout the entire project development process. Based on these evaluations, the FTA decides, with Congressional review, whether a project should move forward to the next phase of project development. The criteria used for evaluating New Starts projects (see Figure 10-5) include the following project justification criteria[2]:

- Mobility improvements – measured by the number of transit trips using the project, their travel-time benefits per project passenger mile, number of trips made by transit dependent riders using the project and their user benefits per project passenger mile, and the share of user benefits received by transit dependent riders compared to the share of transit dependents in the region
- Environmental benefits – measured by Environmental Protection Agency (EPA) air quality designation
- Cost-effectiveness – measured as the cost per hour of travel time saved (often referred to as the cost-effectiveness index)
- Operating efficiencies – measured by system operating cost per passenger mile
- Transit supportive land use – measured by existing population and employment within ½ mile of station areas
- Economic development effects – measured by transit-supportive plans and policies in place and the performance and impact of those policies
- Other – a number of optional factors, including environmental justice considerations and equity issues, opportunities for increased access to employment for low-income persons, and others

The FTA also takes into consideration the local funding commitment. Based on a combination of the project justification and local funding commitment scores, FTA then rates projects as high, medium-high, medium, medium-low or low.

2 Subject to change. Source: Reporting Instructions for the Section 5309 New Starts Criteria, US DOT FTA, July 2010.

10.7.2. Small Starts Evaluation Criteria

The FTA evaluates Small Starts project using the following criteria[3]:

- Cost-effectiveness – measured as incremental cost per hour of transportation system user benefits as compared to the baseline alternative (using opening year forecast)
- Transit supportive land use – measured by existing population and employment within ½ mile of station areas
- Economic development effects – measured by transit-supportive plans and policies in place and the performance and impact of those policies
- Other factors – measured by economic development benefits and use of congestion pricing

The FTA also takes into consideration the local funding commitment. The project will receive a medium rating if the project sponsor can demonstrate a reasonable plan to secure the local funding share, the agency is in reasonably good financial condition, and the additional operating and maintenance costs of the project are less than five percent of the agency's operating budget.

Figure 10-5 – Federal Project Justification Criteria for Transitway Projects

Evaluation Criteria	Measures	New Starts	Small Starts	Very Small Starts
Mobility Improvements	• Number of Transit Trips • User benefits per project passenger mile • Number of transit dependents using the project • Transit dependent user benefits per passenger mile • Share of transit dependent riders compared to share of transit dependent riders in the region	Yes	Yes	3,000/day existing riders
Environmental Benefits	• EPA air quality designation	Yes	No	No
Cost-Effectiveness	• Incremental cost per hour of transportation system user benefit between the baseline and build alternatives	Yes (2030)	Yes (Opening Year)	Automatic medium rating
Operating Efficiencies	• Incremental difference in system-wide operating cost per passenger mile	Yes	<5% of total operating	<5% of total operating costs

3 Subject to change. Source: Reporting Instructions for the Section 5309 Small Starts Criteria, US DOT FTA, July 2010.

	between the build and baseline alternatives		cost	
Transit Supportive Land Use	• Existing population and employment within ½ mile of station areas	Yes	Yes	Automatic medium rating
Economic Development Effects	• Transit supportive plans and policies • Performance & impacts of policies	Yes	Yes	Automatic medium rating
Other	• Environmental justice considerations and equity issues • Opportunities for increased access to employment for low-income persons	Yes	Yes	Yes

10.7.3. Very Small Starts Evaluation Criteria

The FTA uses a very simplified evaluation process for Very Small Starts projects. A Very Small Starts project must be a bus, rail or ferry project, and it must contain the following features: transit stations, signal priority, low floor/level boarding vehicles, special branding, frequencies of at least 10 min peak/15 min off peak, service at least 14 hours per day, and an existing ridership of at least 3,000 per day. The total project cost must be less than $50 million and must cost less than $3 million per mile (excluding vehicles). If it meets these conditions, the project is given an automatic medium rating for cost-effectiveness and land use/economic development. The project will receive a medium rating for local financial commitment if the project sponsor can demonstrate that funds are available for the local share, the agency is in reasonably good financial condition, and the additional operating and maintenance cost of the project will be less than 5 percent of the agency's operating budget.

10.7.4. Non- New/Small Starts Projects

There are no existing criteria for the evaluation of non-New/Small/Very Small Starts projects in the Twin Cities. To date, most such projects have used measures similar to the above described federal evaluation criteria to compare alternatives and make investment decisions. In many cases, the federal process is used to ensure that the project meets federal funding requirements in the event that federal funding is sought at a future stage in the project development process.

As a result, all regional transitway projects should consider both qualitative and quantitative factors for both opening year and the planning horizon year. These factors are presented in the Regional Transitway Guidelines.

10.8. PROJECT DEVELOPMENT, LEADERSHIP, AND OVERSIGHT GUIDELINES

After reviewing relevant background information and existing conditions and gathering input from the technical committees, the Transitway Guidelines Advisory Committee, and Metropolitan Council and Metro Transit senior staff the following Project Development, Leadership and Oversight (PDLO) Guidelines are recommended for adoption. It is important to note that the committee worked to ensure these guidelines are not overly prescriptive, but rather provide a consistent basis for planning, designing, constructing, and operating Commuter Rail, LRT, and BRT services in the metropolitan area. The guidelines should be considered collectively when making project development, leadership, and oversight decisions for transitways. The guidelines are summarized and discussed below.

10.8.1. Project Development Process

State and federal funds may only be used for transitway development if the transitway is part of the regional Transportation Policy Plan (TPP) adopted by the Metropolitan Council.

A project development process similar to the federally required processes for New Starts or Small Starts/Very Small Starts should be used for all major transitway capital investment projects to ensure that the project will be eligible for federal funding should federal funding be needed or become available later in the project development process.

The locally preferred alternative (LPA) is reviewed and approved by the Metropolitan Council and amended into the TPP.

All transitway projects need to be developed using a planning and design process that carefully evaluates alternatives and weighs costs, benefits, and impacts. Many agencies and stakeholders will need to be coordinated throughout the project development process. The complexity of the process and level of National Environmental Protection Act (NEPA)/Minnesota Environmental Policy Act (MEPA) review should be reflective of the size, complexity, and any potential controversy of the project. While similar evaluation criteria and a similar project development process may be used, FTA review and involvement is only required when federal funding is being used for the project.

The roles and responsibilities can change throughout a transitway project development process, but it is important to ensure that the process that is followed is consistent with any existing or future funding source requirements. For example, although local municipalities (e.g. regional railroad authority, city) often initiate projects in the early phases, such as scoping or alternative analysis, and often do so with local funds, a consistent project development process must be used to qualify a project for New Starts or Small Starts/Very Small Starts funding.

10.8.2. Coordination of Agencies and Stakeholders

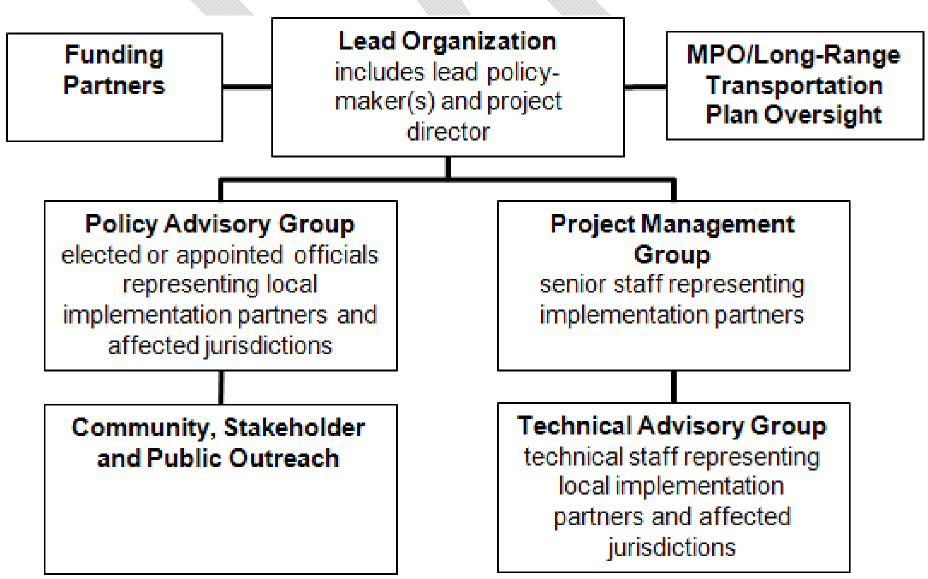
All major transitway capital investment projects should have a coordination structure that reflects the following functions:

- *Coordination with, and reporting to, the funding partners*
- *Coordination with the Metropolitan Council and Mn/DOT*
- *A clearly identified lead agency determined by Metropolitan Council with input from funding partners and the Commissioner of Transportation*
- *Coordination with the elected/appointed officials of the implementation partners (policy advisory group) (for design and construction of LRT projects, Minn. Stat. 473.3994 Subd. 10 requires a corridor management committee)*
- *Coordination with the management and technical staff of the implementation partners (technical advisory group and/or project management group)*
- *Effective outreach to, and involvement of, external stakeholders and the general public*

When both a county that is a member of the Counties Transit Improvement Board (CTIB) and CTIB are represented on the policy advisory group, the lead agency should request that CTIB appoint a member to the policy advisory group who represents an area outside the geographic boundaries of the transitway project.

All transitway projects will likely have multiple agencies and stakeholders involved in planning, design, and construction. Therefore, a clearly defined means of interagency coordination, stakeholder outreach, and decision-making will be needed. Figure 10-6 illustrates typical project leadership and oversight roles and relationships in a transitway development process. Each project and each stage in the project development process may have different needs for coordination and interagency involvement. For example, it is useful to have an interagency marketing/communications team that supports start-up and ongoing operations. It is also often useful to have an interagency team that coordinates land development and land use planning activities.

Figure 10-6 – Typical Project Leadership and Oversight Functions



10.8.3. Lead Agency Candidates and Responsibilities

The lead agency is an important component of project delivery and coordination in all phases of transitway implementation, even when not specified by legislation. The following guidelines relate to the lead agency candidates and responsibilities:

- *There must be a clearly identified lead agency for a major transitway capital investment project and this agency must accept all of the responsibilities for delivering the transitway project. The lead agency has the option of delegating responsibilities to other agencies/entities but is responsible for ensuring that all necessary tasks are accomplished. The lead agency may change as a project progresses from one phase to the next.*
- *When multiple agencies are involved in transitway development, interagency agreements (or other similar formal agreements) are strongly recommended to clearly identify roles, responsibilities, authorities, deadlines, budgets, and funding sources.*
- *Mn/DOT is the lead agency for implementing Commuter Rail following selection of the LPA (Mn/DOT may delegate this authority).(Minn. Stat. 174.82)*
- *Mn/DOT or the Metropolitan Council/Metro Transit, at the discretion of the governor, is the lead agency for implementing light rail following selection of the LPA. (Minn. Stat. 473.3994, subd. 1a)*
- *The Metropolitan Council/Metro Transit is the preferred lead agency for implementing BRT following selection of the LPA but, with Council agreement, the lead agency may be a joint powers board, a county, or a city. Mn/DOT may be the lead agency on BRT projects requiring construction in trunk highway right of way.*
- *Mn/DOT, regional railroad authorities, joint powers boards, counties, cities or the Metropolitan Council may be the lead agency for transitway capital projects prior to the selection of a LPA.*

There are no legal precedents governing lead agency candidates for certain aspects of transitway development, including planning and BRT implementation. This was identified as a project implementation gap that should be addressed by the Guidelines given the importance of the role of the lead agency in project delivery and coordination. The lead agencies for Commuter Rail and LRT following selection of the LPA are established by legislation. For BRT or for earlier stages in the project development process for LRT and/or Commuter Rail, the Metropolitan Council and Mn/DOT are responsible for determining the lead agency in consultation with funding partners. Metro Council has the statutory responsibility for Commuter Rail development in a corridor after commencement of revenue service, including planning, design, acquisition, construction, and equipping of any improvement of a line. The responsibilities associated with the role of lead agency are significant and the agency desiring to assume this role should understand the full range of these responsibilities and the cost and staffing requirements necessary to fulfill this role. Coordination with all affected agencies is required and many tasks may be accomplished by partner agencies through interagency agreements.

10.8.4. Financial Management Responsibilities

The lead agency is responsible for financial management of the transitway project including:

- *Securing funds*
- *Financial oversight and reporting*
- *Financial planning and budgeting*
- *Interagency coordination*
- *Accounting*
- *Cost estimating and cost control*
- *Any other aspects of financial management*

Financial management is extremely important to the success of any project and is often very complex on transitway projects due to exacting federal requirements and multiple funding sources and funding agencies. It is the responsibility of the lead agency to manage all financial aspects of the project or to enlist the assistance of partner agencies to provide these services through interagency agreements. Some examples of the most important elements of financial management include:

- Seeking funding for the project, including preparing and submitting grant applications
- Understanding and implementing all requirements of funding agencies including securing grant match funds, monitoring and oversight, providing required reporting, ensuring legal requirements are met, and any other expectations of the funding agencies
- Insuring that all legal requirements and funding agency requirements are met when procuring services, vehicles, materials, etc…
- Completing timely and accurate financial planning including the preparation of financial management plans that may be required by funding agencies
- Completing timely and accurate cost estimates for construction, procurement, and operations and maintenance
- Managing all accounting functions including budgeting and cash flow management
- Assessing financial risk and identifying strategies for addressing those risks
- Monitoring and managing costs to stay within budgets

10.8.5. Transit Operator Selection

The following Guidelines relate to the selection of the transit operator for a transitway:

- *The transit operator for Commuter Rail located in whole or in part in the metropolitan area will be Metro Transit. (Minn. Stat. 473.4057 subd. 1)*
- *Metro Transit will be the transit operator for all LRT in the metropolitan area. (Minn. Stat. 473.4051 subd. 1)*
- *Metro Transit and Suburban Transit Providers will continue to operate BRT express services within their respective jurisdictions.*
- *Metropolitan Council will determine the transit operator for highway BRT station-to-station services with input from funding partners. The Metropolitan Council will directly operate these routes through Metro Transit, bid them competitively or award a sole source contract in the case of a Congestion Mitigation and Air Quality (CMAQ) grant or other special circumstances.*
- *Metro Transit will operate Arterial BRT within their respective jurisdiction.*

According to the agreed-upon funding formula for new rail and Highway BRT service, Highway BRT station-to-station service in both the Cedar Avenue and the I-35W South corridors will be funded by CTIB (50 percent) and Metropolitan Council (50 percent). Because Highway BRT services are not wholly within a Suburban Transit Provider's jurisdiction; and they are funded with regional funds; the CTIB has deferred transit operations to the Metropolitan Council. Therefore, the responsibility for the selection of a transit operator rests with the Metropolitan Council. The Metropolitan Council makes the determination of whether to competitively bid services based on the amount of service to be procured, and the anticipated benefits and costs of a competitive procurement, or to award a sole source contract.

10.8.6. Transit Service Planning

Metropolitan Council/Metro Transit will lead or delegate transit service planning for transitway service in the region, including Commuter Rail, LRT, Highway BRT station-to station, and Arterial BRT services.

Metro Transit and Suburban Transit Providers will continue service planning for BRT express and local services within their respective jurisdictions.

Metropolitan Council/Metro Transit and the affected suburban transit provider(s) must coordinate closely when planning and operating services in BRT corridors to ensure that local, express and station-to-station services are well coordinated, not duplicative, transfers are timely, and stations are used efficiently.

Infrastructure corridor planning remains a local responsibility through selection of a LPA. After LPA selection, the lead agency is responsible for coordinating with the appropriate service providers for service planning to support facility planning. Close coordination between service and facility planning is critical for determining appropriate station locations and sizes and other facility needs within individual corridors.

10.8.7. Transitway Travel Demand Forecasting

The following Guidelines relate to Travel Demand Forecasting for transitway projects:

- *The Regional Transit Demand Forecast Model, maintained by the Metropolitan Council, is the preferred method for developing transitway travel demand forecasts. Exceptions should be justified and documented by the requesting agency and approved by Metropolitan Council forecasting staff.*
- *A project's lead organization is responsible for directing travel demand forecasting and other work being performed by one or more consulting firms and for involving Metropolitan Council forecasting staff. Metropolitan Council forecasting staff has oversight responsibility for ensuring quality and defensible ridership forecasting. Council staff should be consulted during all stages of forecast development for any phase of transitway development.*
- *The travel demand forecasting model should be validated, on a corridor level, against observed data before using it for forecasting. Forecasting input data for the base model should be based on the latest planning assumptions including:*
    - *The most recent adopted socio-economic data*
    - *Highway and transit networks in the adopted Transportation Policy Plan*
- *The presentation of ridership for transitway projects is an important aspect of overall project delivery, including presentation to decision-makers and the public. It is important that ridership results are presented in a manner that is clear and consistent, regardless of mode. At a minimum, the following ridership results should be separately presented for each mode:*
    - *LRT: Rides taken using the LRT service*
    - *Commuter Rail: Rides taken using the Commuter Rail service*
    - *BRT:*
        - *Rides taken using the BRT station-to-station services*
        - *Rides taken on local or express services that utilize a defined transitway runningway for at least 50 percent of the route and use at least one non-downtown transitway station*
    - *Local feeder service ridership should not be included in any transitway ridership figures.*

The Regional Transit Demand Forecast Model (Regional Model) is the preferred method for travel forecasting because the model:

- Reflects all geographic and trip markets
- Is sensitive to future development scenarios
- Can analyze trips by station/stop
- Can follow trips from origin to destination
- Can measure trip-based user benefits

There may be situations where a rule-based modeling tool is appropriate to use but the use of such models should be thought through carefully and the reasons for using a rule-based model should be justified and documented.

Consultation with Metropolitan Council staff should include, at a minimum, development of a proposed scope of work, review of methodology before any modeling work begins, review of no-build or baseline input assumptions, review of model validation prior to proceeding with forecasts, and review of draft forecasts prior to their presentation to project stakeholders, including policy makers and the general public. This consultation is meant to be part of a collaborative process. Staff will provide current guidance on the use and validation of the Regional Model. Metropolitan Council staff will have a Travel Demand Forecast User Guide available upon request, which can serve as a starting point for the forecasting process and consultation. When forecasting is complete, electronic copies of the developed model and all data should be sent to the Metropolitan Council for preservation.

Land use and socio-economic forecasts for the horizon year should be based on approved Metropolitan Council municipal totals and should be consistent with the latest planning assumptions and local comprehensive plans, including comprehensive plan amendments. Highway and transit networks should be consistent with the adopted TPP. Sensitivity tests of input data are worthwhile but not required. Service planning assumptions should be reviewed by appropriate transit agencies and Metropolitan Council staff

The ridership definition is intended to ensure that transitway ridership is calculated consistently for all transitways in the region. This definition includes all riders that benefit significantly from the transitway investment while ensuring that riders are not double-counted between feeder service and transitway service and that riders that do not benefit significantly from the transitway investment are excluded. The FTA does not have a formal definition of ridership, since their measures primarily look at system-wide impact and user benefit calculations. However, the definition of utilizing the transitway runningway for at least 50 percent of the route is structured after FTA's definition of a fixed-guideway for major capital investment funding eligibility.

10.8.8. Capital Investment Criteria

Any major transitway investment project that will seek federal funding through the federal New Starts, Small Starts, or Very Small Starts programs must use the federal process for the evaluation of capital investment.

Evaluation of all major transitway investment projects, whether funded with federal, state or regional funds, should consider at least the following <u>quantitative</u> factors for both opening year and the planning horizon year:

- *Ridership including total riders, new transit riders, and number of transit dependent riders*
- *Land use as measured by population, employment, and affordable housing units within ½ mile of stations*
- *Cost-effectiveness including annualized capital and operating cost/ride, passengers/service mile, passenger miles/service mile*
- *Transit travel-time savings over existing local bus service*
- *Congestion as measured by congested roadway miles in corridor*

Evaluation of all transitway projects should consider at least the following <u>qualitative</u> factors for both opening year and the planning horizon year:

- *Environmental benefits and impacts, including environmental justice considerations*
- *Economic development impacts*
- *Land use benefits and impacts*
- *Livability*
- *Sustainability*
- *Equity*
- *Local support*

10.8.9. Deviations from Transitway Guidelines

Deviations from the Regional Transitway Guidelines that have significant cost and/or operational implications should trigger discussion with funding partners (Metropolitan Council, Mn/DOT, CTIB, and Regional Railroad Authorities.

In general, the Regional Transitway Guidelines are intended to establish a baseline for transitway facilities and services while providing flexibility to lead agencies in managing the broad array of issues that must be balanced during the planning and design process. The Guidelines provide parameters for decisions that have considerable flexibility for planning, designing, building and operating regional transitways. Some of the guidance sets clear thresholds for certain decisions, and there may be times when greater flexibility is needed than is found in the guidance. Issues that arise which have significant cost and/or operation implications should trigger discussion and negotiation between the funding partners, including Metropolitan Council, CTIB and others as appropriate and the proposing entity or lead agency. The lead organization, in consultation with technical and policy advisory groups, is responsible for initiating discussions and negotiations with the funding partners as to the need for a deviation and whether a deviation is warranted.